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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R1–ES–2017–0050; FXES11130900000C6–189–FF09E42000]

RIN 1018–BC10

Endangered and Threatened Wildlife and Plants; Reclassifying the Hawaiian Goose from Endangered to Threatened with a Section 4(d) Rule

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: Under the authority of the Endangered Species Act of 1973, as amended (Act), we, the U.S. Fish and Wildlife Service (Service), determine threatened status for the Hawaiian goose (nene) (*Branta sandvicensis*). This rule changes the listing status of the nene from an endangered species to a threatened species on the List of Endangered and Threatened Wildlife. We call this “reclassifying” or “downlisting” the species. We are also adopting a rule under the authority of section 4(d) of the Act (a “4(d) rule”) to enhance conservation of the species through range expansion and management flexibility. This final rule is based on a thorough review of the best available scientific data, which indicate that the threats to this species have been reduced to the point that it no longer meets the definition of endangered under the Act, but that it is likely to become an endangered species within the foreseeable future. In addition, this rule corrects the Federal List of Endangered and Threatened Wildlife to reflect that *Nesochen* is not currently a scientifically accepted generic name for this species, and acknowledges the

Hawaiian name “nene” as an alternative common name.

DATES: This rule is effective [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

ADDRESSES: This final rule is available on <http://www.regulations.gov> under Docket No. FWS–R1–ES–2017–0050. Comments and materials received, as well as supporting documentation used in preparation of this final rule, are available for public inspection at <http://www.regulations.gov>, or by appointment at: U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Room 3-122, Honolulu, HI 96850; telephone 808-792-9400.

FOR FURTHER INFORMATION CONTACT: Katherine Mullett, Acting Field Supervisor, telephone: 808–792–9400. Direct all questions or requests for additional information to: U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Room 3-122, Honolulu, HI 96850. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, a species may warrant reclassification from endangered to threatened if it no longer meets the definition of endangered (in danger of extinction). The reclassification of a listed species can only be completed by issuing a rule. The endangered designation no longer correctly reflects the current status of the nene due to a substantial improvement in the species’ status. This rule finalizes the reclassification of the nene as a threatened species. Furthermore,

changes to the take prohibitions in section 9 of the Act, such as those we enact for this species under a section 4(d) rule, can only be made by issuing a rule. This rule finalizes provisions under the authority of section 4(d) of the Act and is necessary and advisable for the conservation needs of the nene.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species based on any one or a combination of five factors described in section 4(a)(1) of the Act: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We have determined that the nene is no longer at risk of extinction and, therefore, does not meet the definition of endangered, but is still affected by the following current and ongoing threats to the extent that the species meets the definition of a threatened species under the Act:

- Habitat destruction and modification due to urbanization, agricultural activities, nonnative ungulates, and nonnative vegetation;
- Predation by nonnative mammals such as mongoose, cats (feral and domestic), dogs (feral and domestic), rats, and pigs;
- Diseases such as toxoplasmosis, avian pox, avian botulism, avian malaria, omphalitis, West Nile virus, and avian influenza;
- Human activities such as motor vehicle collisions, collisions at wind energy facilities, artificial hazards (*e.g.*, fences, fishing nets, erosion control material), feeding and habituation, and recreational activities (*e.g.*, human visitation at parks and refuges);

and

- Stochastic events such as drought, hurricanes, and floods.

Environmental effects from climate change are likely to exacerbate the impacts of drought, hurricanes, and flooding associated with storms and hurricanes, as well as causing flooding of portions of nene habitat due to sea-level rise. Impacts associated with climate change may become a threat in the future. Existing regulatory mechanisms and conservation efforts do not effectively address the introduction and spread of nonnative plants and animals and other threats to the nene.

Under section 4(d) of the Act, when a species is listed as a threatened species, the Secretary of the Interior (Secretary) has discretion to issue such regulations he or she deems necessary and advisable to provide for the conservation of the species. For fish or wildlife listed as threatened, the Secretary may, by regulation, prohibit any act prohibited under section 9(a)(1) of the Act. For the nene, the Service has determined that a 4(d) rule is appropriate as a means to facilitate conservation and expand the species' range by increasing flexibility in management activities for our State partners and private landowners. The Service has modified the normal take prohibitions to allow certain activities to be conducted on lands where nene occur or where they would occur if we were to reintroduce them to areas of their historical distribution. Under this 4(d) rule, take of nene caused by actions resulting in intentional harassment that is not likely to cause direct injury or mortality, control of introduced predators, or habitat enhancement beneficial to nene is not prohibited under Federal law. This 4(d) rule identifies these activities to provide protective mechanisms to landowners and their agents so that they may continue with certain activities that are not anticipated to cause direct injury or

mortality to nene and that will facilitate the conservation and recovery of nene. Federally implemented, funded, or permitted actions will continue to be subject to the requirements of section 7 of the Act and eligible for an incidental take exemption through section 7 of the Act.

Peer review and public comment. We sought comments from independent specialists to ensure that our determination is based on scientifically sound data, assumptions, and analyses. We invited these peer reviewers to comment on the downlisting proposal. We also invited government agencies, the scientific community, industry, Native Hawaiian organizations, and any other interested parties to submit comments or recommendations concerning any aspect of the proposed rule. We considered all comments and information we received during the comment period.

Summary of Changes from Proposed Rule

In preparing this final rule, we reviewed and fully considered comments from the peer reviewer and public on the proposed downlisting of nene with a 4(d) rule. This final rule incorporates the following substantive changes to our proposed rule, based on the comments we received:

(1) During the comment period, we received new information regarding the recent volcanic activity on the island of Hawaii. We have added an analysis of the effects of volcanic activity to portions of nene habitat under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range*.

(2) During the comment period, we received new information regarding impacts of floods resulting from storms and hurricanes on nene eggs and goslings. We have added an analysis of the effects of flooding resulting from storms and hurricanes to nene eggs

and goslings under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence*. This threat is anticipated to be exacerbated by the increasing global surface temperature associated with greenhouse gases resulting from human activities.

(3) We have incorporated updated information from the Hawaii Department of Land and Natural Resources (DLNR) on the most recent nene population counts into the rule (see *Species Information* below).

(4) We added language under *Recovery Planning and Implementation of Recovery Actions for the Nene* to further clarify the status of nene on Molokai and to more clearly reflect our analysis under *Overall Summary of Factors Affecting Nene*.

(5) We added a definition of “qualified biologist” to the 4(d) rule.

(6) We added surveys that further the recovery of nene to the excepted forms of take in the 4(d) rule.

(7) We modified the 4(d) rule to explicitly identify six categories of prohibited actions, which resulted in changes to its organizational structure and narrative justification but no substantive alteration in either prohibited or excluded actions.

(8) Under 50 CFR 17.41(d)(3)(iii)(A)(3), we’ve added that the landowner must arrange follow-up surveys of the property by qualified biologists to assess the status of birds present to the actions necessary should a nest be discovered during any intentional harassment activities excepted in this final 4(d) rule.

Background

Previous Federal Actions

Please refer to the proposed downlisting with a 4(d) rule, published in the *Federal Register* on April 2, 2018 (83 FR 13919), for previous Federal actions for the nene prior

to that date. The publication of the proposed downlisting with a 4(d) rule opened a 60-day comment period, ending on June 1, 2018. In addition, we published a public notice of the proposed rule on May 5, 2018, in the Honolulu Star Advertiser, Hawaii Tribune Herald, The Garden Island, and West Hawaii Today; on May 9, 2018, in the Molokai Dispatch; and on May 12, 2018, in The Maui News.

Species Information

Please see the April 2, 2018, proposed rule (83 FR 13919) regarding the history of the scientific and common names of the nene. This final rule adopts the currently accepted scientific name, *Branta sandvicensis*, and the common Hawaiian name “nene,” on the Federal List of Endangered and Threatened Wildlife (List; 50 CFR 17.11(h)). Hawaiian goose remains an accepted common name on the List. Please also see the proposed rule (83 FR 13919; April 2, 2018) for a physical description of nene and a summary of its current and historical range, habitat description and use, movement patterns, life history, demography, and population status.

Here, we provide only new information we received since the publication of the April 2, 2018, proposed rule. We received the 2017 statewide nene count of individuals from the Hawaii DLNR, which includes a statewide population of 3,252 individuals comprised of 1,104 individuals on Hawaii, 1,482 individuals on Kauai, 627 individuals on Maui, 37 individuals on Molokai, and 2 individuals on Oahu. These estimates include the 646 translocations made from Kauai to Hawaii (598) and Maui (48), between 2011 and 2016. We have incorporated this information into this final rule.

Recovery Planning

Section 4(f) of the Act (16 U.S.C. 1531 et seq.) directs us to develop and implement recovery plans for the conservation and survival of endangered and threatened species unless we determine that such a plan will not promote the conservation of the species. Under section 4(f)(1)(B)(ii), recovery plans must, to the maximum extent practicable, include “objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of [section 4 of the Act], that the species be removed from the list.” However, revisions to the Lists of Endangered and Threatened Wildlife and Plants (adding, removing, or reclassifying a species) must be based on determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is endangered or threatened (or not) because of one or more of five threat factors. Section 4(b) of the Act requires that the determination be made “solely on the basis of the best scientific and commercial data available.” While recovery plans provide important guidance to the Service, States, and other partners on methods of enhancing conservation and minimizing threats to listed species, as well as measurable criteria against which to measure progress towards recovery, they are not regulatory documents and cannot substitute for the determinations and promulgation of regulations required under section 4(a)(1) of the Act. A decision to revise the status of a species on, or to remove a species from, the Federal List of Endangered and Threatened Wildlife (List; 50 CFR 17.11(h)) is ultimately based on an analysis of the best scientific and commercial data then available to determine whether a species is no longer an endangered species or a threatened species, regardless of whether that information differs from the recovery plan.

There are many paths to accomplishing recovery of a species, and recovery may

be achieved without all of the criteria in a recovery plan being fully met. For example, one or more criteria may be exceeded while other criteria may not yet be accomplished. In that instance, we may determine that the threats are minimized sufficiently and the species is robust enough to delist. In other cases, recovery opportunities may be discovered that were not known when the recovery plan was finalized. These opportunities may be used instead of methods identified in the recovery plan. Likewise, information on the species may be learned that was not known at the time the recovery plan was finalized. The new information may change the extent to which existing criteria are appropriate for recognizing recovery of the species. Recovery of a species is a dynamic process requiring adaptive management that may, or may not, follow all of the guidance provided in a recovery plan.

In 1983, the Service published the Nene Recovery Plan and concluded that the nene population in the wild was declining; however, the exact causes of the decline were not clearly understood (USFWS 1983, p. 24). The statewide population was estimated at approximately 600 nene with 390 ± 120 nene on Hawaii and 112 nene on Maui. Based on the available data, the plan recommended the primary objective to delist the species was establishing a population of 2,000 nene on Hawaii and 250 nene on Maui, well distributed in secure habitat and maintained exclusively by natural reproduction (USFWS 1983, p. 24). The plan focused on maintenance of wild populations through annual releases of captive-reared birds to prevent further population decline, habitat management including control of introduced predators, and conducting research to determine factors preventing nene recovery and appropriate actions to overcome these factors. The plan also acknowledged that more research, biological data, and better population models would

lead to a reassessment of recovery efforts and criteria for delisting the species.

On September 24, 2004, the Service made the Draft Revised Recovery Plan for Nene (USFWS 2004) available for public review and comment (69 FR 57356). The draft revised recovery plan presented additional information on the status of the species, factors affecting species recovery, and an updated framework for species recovery. Although this plan was not finalized, it has been our guiding document regarding recovery of the nene for the past decade and a half. At the time the draft revised recovery plan was written, the statewide population was estimated at approximately 1,300 nene with populations on Hawaii (350), Maui (250), Kauai (620), and Molokai (55). The primary factors affecting the nene recovery in the wild were: (1) Predation by introduced mammalian predators (Factor C); (2) inadequate nutrition (Factor E); (3) lack of lowland habitat (Factor A); (4) human-caused disturbance and mortality (Factor E); (5) behavioral issues (Factor E); (6) genetic issues (Factor E); and (7) disease (Factor C). The draft revised recovery plan recommended the following three criteria for downlisting the nene from endangered to threatened: (1) Self-sustaining populations exist on Hawaii, Maui Nui (Maui, Molokai, Lanai, Kahoolawe), and Kauai with a target of at least 2,000 birds distributed in 7 populations over 15 years; (2) sufficient suitable habitat to sustain the target population levels on each island is identified, protected, and managed in perpetuity (USFWS 2004, pp. 50–52); and (3) consideration for delisting could occur once all of the downlisting criteria had been met, and population levels on Hawaii, Maui Nui, and Kauai had all shown a stable or increasing trend (from downlisting levels) for a minimum of 15 additional years (*i.e.*, for total of 30 years). Self-sustaining was defined as maintaining (or increasing) established population levels without additional releases of captive-bred

nene, although we recognized that continued management, such as predator control or pasture management (*e.g.*, mowing or grazing regime), may need to be continued.

As noted in the April 2, 2018, proposed rule (83 FR 13919), and throughout this final rule, substantial self-sustaining populations exist and are well distributed in multiple localities on the islands of Hawaii, Kauai, and Maui (NRAG 2017; Amidon 2017, *entire*; DLNR 2018, *in litt.*), totaling 3,252 individuals (DLNR 2018, *in litt.*). Populations on Maui and Hawaii have been observed to be stable without external supplementation since about 2011, when active translocations from Kauai were discontinued; Kauai populations have been stable to increasing for several decades while also providing stock for translocation. The species continues to be conservation-reliant (*i.e.*, dependent on long-term management commitments to active predator control and habitat management), but with ongoing management we expect populations on these three islands to continue to be self-sustaining without additional releases of captive-bred birds. As discussed in the proposed rule and this final rule, under Factor A, certain habitat stresses continue to exist, but as nene have proven adaptable to diverse native and human-modified habitats, it appears that, with active management, the extent and quality of existing breeding habitat is sufficient to support robust populations in multiple localities throughout the species' range. Additional management in seasonally occupied non-breeding habitat would improve population viability.

The 2004 draft revised recovery plan sets forth the general recovery strategy for nene (USFWS 2004, p. 47), as follows: In order for nene populations to survive they should be provided with generally predator-free breeding areas and sufficient food resources. Human-caused disturbance and mortality should be minimized, and genetic and

behavioral diversity maximized. The goal of recovery stated in the draft revised recovery plan is to enable the conservation of nene by using a mix of natural and human-altered habitats in such a way that the life-history needs of the species are met and the populations become self-sustaining. While it is important to restore nene within its native ecosystem to ensure long-term species survival, nene currently successfully use a gradient of habitats ranging from highly altered to completely natural. Additionally, some populations exhibit behaviors that differ from what it is believed wild birds historically displayed. Nene are a highly adaptable species, which bodes well for recovery of the species.

Conservation needs and activities to recover nene vary among islands due to differences in factors affecting nene populations both within and among islands. For example, although mongoose occur on Hawaii, Maui, and Molokai, Kauai does not yet have an established mongoose population; thus predator control priorities there are different. In addition, elevations used by nene vary among sites and among islands, and vegetation available to nene also differs between sites and by island.

Implementation of Recovery Actions for the Nene

Nene are now more abundant than when they were federally listed as endangered in 1967, due largely to a captive propagation program that began in 1949 before the species was listed and continued through 2011, when it was stopped due to successful breeding in the wild. This program was implemented collaboratively by the Territory and later the State of Hawaii, the Peregrine Fund, and the Zoological Society of San Diego. In addition, a number of zoos and private facilities in the United States and abroad continue to maintain and breed nene in captivity (Kear and Berger 1980, pp. 59–77;

Marshall 2017, pers. comm.). The existence of captive nene outside of Hawaii provides additional insurance against extinction of the species, but due to concerns about disease introduction, they are not used currently as a source for supplementation of the wild population and are not considered a significant contributor to conservation of the species. However, they are still subject to permitting requirements under the Act for interstate commerce.

In the years between 1960 and 2008, some 2,800 captive-bred nene were released into areas of their former range at more than 20 sites throughout the main Hawaiian islands. Most releases of captive birds used open-top pens to provide protection from predators. The pens provide protection to the birds as long as they are inside the pens, and the birds frequently returned to breed in the same pens in subsequent years.

Many of the earlier releases were accompanied by little or no management of predators and habitats. Monitoring of released birds showed high mortality and low nesting success, indicating that food availability and predators had a significant impact on wild populations (Banko 1992, pp. 102–104). The highest levels of survival and reproductive success were documented at Hawaii Volcanoes and Haleakala National Parks, where more intensive management of threats was initiated, demonstrating the need and benefits of habitat management and predator control (Black *et al.* 1997, p. 1,171). Recent years have seen an increase in the capacity of conservation agencies and partners to manage habitat and control predators on larger spatial scales. Although not all release sites have supported sustained populations (*e.g.*, Molokai), areas in which predators are low or controlled and habitat is managed for native food plant species have allowed nene to fare better (Hawaii Division of Forestry and Wildlife 2012, p. 19).

Nene have re-established traditional movement patterns in two breeding subpopulations on the island of Hawaii (Hess *et al.* 2012, pp. 480–482; Leopold and Hess 2014, pp. 67–78). Nene spend the breeding and molting seasons at lower elevations from September to April, and move to higher elevation areas during the non-breeding season in May to August. Hess *et al.* (2012, pp. 479, 482) contend that this movement pattern may be beneficial to nene for the following reasons: (1) Altitudinal migration may allow nene to track availability of food resources not otherwise seasonally available (Black *et al.* 1997, pp. 1,170–1,171); (2) migration may enhance survival during the non-breeding season by avoiding nonnative predators in (lowland) breeding areas; (3) nene may be able to reduce exposure to human activities by occupying high-elevation areas during the non-breeding season; and (4) there may be opportunities for greater genetic exchange if pair bonds are formed between individuals from separate breeding subpopulations at non-breeding locations. This movement pattern is believed to have occurred historically (Banko *et al.* 1999, pp. 3–4).

Population Viability Analyses and Mortality Rates

A population viability analysis modelled the long-term fate of nene under three different management scenarios: (1) No further releases or management, (2) releases mirroring those of the past 30 years, and (3) increased management without further releases. Only under the third scenario could all three populations (Hawaii, Maui, and Kauai) survive for 200 years; thus, reintroduction alone as a management tool may continue to be effective in delaying extinction on Hawaii, but will not lead to a self-sustaining population. The study concluded that enhanced management efforts, which include an appropriate predator control effort, would enable nene to reach a self-

sustaining level (Black and Banko 1994, entire).

Another population viability analysis was conducted for nene in Hawaii Volcanoes National Park to examine management options more specific to that area (Hu 1998). First-year mortality was identified as the primary limiting factor for nene in Hawaii Volcanoes National Park. From 1990 to 1996, survival of fledglings averaged 84 percent for females and 95 percent for males, while survival from laying to fledging ranged from 7 to 19.5 percent (mean 12 percent; Hu 1998, pp. 84–85). While predator control had reduced egg predation, fledging success remained low, largely due to inadequate nutrition. The study found that open-top pens cannot sustain a viable nene population in Hawaii Volcanoes National Park. The study suggests that while management techniques such as grassland management, supplemental feeding, and cultivation of native food plants may sustain nene in Hawaii Volcanoes National Park, such approaches require considerable effort and would require increasing resource expenditures. Thus, it was suggested that nene would be more secure if they were integrated into habitat management instituted on a larger scale that would involve the creation of native-dominated, fire-adapted landscapes at low- and mid-elevations in Hawaii Volcanoes National Park and more efficient, widespread predator control techniques, allowing reestablishment of their seasonal movement patterns between various locations (Hu 1998, pp. 107–114).

Survival data from 1960 through 1990 for released nene on the island of Hawaii showed that the highest mortality rate was found among newly released goslings during drought years. Nene at Hawaii Volcanoes National Park had the lowest annual mortality rates. The three main factors affecting mortality rates were found to be release method,

age at time of release, and year of release. Releasing pre-fledged goslings with parents or foster parents from open-top pens during years with sufficient rainfall was found to be the most successful release method on the island of Hawaii (Black *et al.* 1997, entire). On Kauai, where mongoose are not yet established, protecting the nesting area from other predators, such as dogs and cats, was found to be extremely successful (Telfer 1998, pers. comm., as cited in USFWS 2004).

In a preliminary assessment of the short-term population trends in nene populations on the four main Hawaiian islands where nene currently occur, count-based and demographic models (Morris and Doak 2002, pp. 8–9) were developed with readily available information on each population (Hu 1998; Hu 1999, unpubl. as cited in Banko *et al.* 1999; USFWS 2004; Bailey and Tamayose 2016, *in litt.*; Kendall 2016, *in litt.*; Uyehara 2016a, *in litt.*) and projected over a 20-year time period assuming constant management (Amidon 2017, entire). Count-based models (for Hawaii Volcanoes National Park, the island of Maui, Haleakala National Park, the island of Molokai, and the island of Kauai) showed an increase or leveling off around current population estimates (Amidon 2017, pp. 10–16). Demographic models variously projected level or slightly declining populations (Hakalau Forest National Wildlife Refuge (NWR) and Haleakala National Park) or continued increase (Kauai NWR Complex) (Amidon 2017, pp. 18–21). Available data did not allow modeling of nene populations on lands outside national parks and national wildlife refuges, where management and population trends are likely to differ. In the best case scenario, nene populations were predicted to remain stable or increase; however, because the model was based on the assumption that management actions would continue on into the future, it does not support the nene's

viability into the foreseeable future without continuing management.

Current Status Summary

The implementation of recovery actions for nene has significantly reduced the risk of extinction for the species. Once on the brink of extinction, the captive propagation and release program successfully increased the number of individuals and re-established populations throughout the species' range on the islands of Hawaii, Kauai, Maui, and Molokai. Studies of foraging behavior identified nene food preferences and nutritional value of food resources contributing to a greater understanding of habitat requirements during the breeding and non-breeding seasons. Current populations are sustained by ongoing management (*e.g.*, predator control, habitat management for feral ungulates and nonnative plants). On the island of Hawaii, traditional movements are being restored, which could be expected to improve survival and breeding, as well as genetic exchange between subpopulations. Certain key populations are expected to maintain current levels or increase into the future if the current level of management is continued.

Summary of Factors Affecting the Species

Section 4 of the Act and its implementing regulations (50 CFR part 424) set forth the procedures for listing species, reclassifying species, or removing species from listed status. "Species" is defined by the Act as including any species or subspecies of fish or wildlife or plants, and any distinct vertebrate population segment of vertebrate fish or wildlife that interbreeds when mature (16 U.S.C. 1532(16)). A species may be determined to be an endangered or threatened species because of any of one or a combination of the five factors described in section 4(a)(1) of the Act: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for

commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We must consider these same five factors in reclassifying a species from endangered to threatened (*i.e.*, downlisting). We may downlist a species if the best available scientific and commercial data indicate that the species no longer meets the definition of endangered, but instead meets the definition of threatened because the species' status has improved to the point that it is not in danger of extinction throughout all or a significant portion of its range, but is in danger of extinction in the foreseeable future.

Determining whether a species has improved to the point that it can be downlisted requires consideration of whether the species is endangered or threatened because of the same five categories of threats specified in section 4(a)(1) of the Act. A species is “endangered” for purposes of the Act if it is in danger of extinction throughout all or a “significant portion of its range” and is “threatened” if it is likely to become endangered within the foreseeable future throughout all or a “significant portion of its range.”

In considering what factors might constitute threats, we must look beyond the exposure of the species to a particular factor to evaluate whether the species may respond to the factor in a way that causes actual impacts to the species. If there is exposure to a factor and the species responds negatively, the factor may be a threat, and during the five-factor analysis, we attempt to determine how significant a threat it is. The threat is significant if it drives or contributes to the risk of extinction of the species, such that the species warrants listing as endangered or threatened as those terms are defined by the Act. However, the identification of factors that could impact a species negatively may not be

sufficient to compel a finding that the species warrants listing. The information must include evidence sufficient to suggest that the potential threat is likely to materialize (*i.e.*, future foreseeability) and that it has the capacity (*i.e.*, it should be of sufficient magnitude and extent) to affect the species' status such that it meets the definition of endangered or threatened under the Act.

In the following analysis, we evaluated the status of the nene throughout all of its range as indicated by the five-factor analysis of threats currently affecting the species, or that are likely to affect the species within the foreseeable future. As part of our analysis we also evaluated the foreseeability of threats. As nene is a conservation-reliant species, some threats are already present and so already “foreseeable” but we also evaluated the foreseeability of the continued conservation management to address such threats (see discussion below in Determination section).

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

The draft revised recovery plan identified the lack of lowland habitat and inadequate nutrition as two habitat-related stressors limiting nene recovery (USFWS 2004, pp. 29–30). Nene continue to be affected by historical and ongoing habitat destruction and modification caused by urbanization, agricultural activities, drought, feral ungulates, and nonnative plants. These factors limit suitable breeding and flocking habitat, constraining the recovery of nene populations.

Historical habitat loss was largely a result of human activities such as urban development and land conversion for agricultural activities, particularly in lowland areas. Degradation of lowland habitats used by nene began with Polynesian colonization

(around 1,600 years ago) and has continued since European arrival over the past 200 years (Kirch 1982, pp. 7–10). Impacts to lowland habitat included clearing of land for settlements and agriculture; increased frequency of fire; heavy grazing, browsing, and soil disturbance by introduced deer, cattle, goats, sheep, and pigs; and the spread of nonnative plants (Cuddihy and Stone 1990, pp. 103–107).

The threat of destruction and modification of habitat, particularly in lowland areas, by urbanization and land use conversion, including agriculture, is ongoing and expected to continue to limit the amount of nene foraging and nesting habitat. Past land use practices have resulted in great reduction or loss of native vegetation below 2,000 feet (ft) (600 meters (m)) throughout the Hawaiian Islands (TNC 2006). Hawaii's agricultural industries (*e.g.*, sugar cane, pineapple) have been declining in importance, and large tracts of former agricultural lands are being converted into residential areas or left fallow (TNC 2007).

In addition, Hawaii's population increased almost 10 percent between 2003 and 2013, further increasing demands on limited land and water resources in the islands (Hawaii Department of Business, Economic Development and Tourism 2013, *in litt.*). Hawaii's average annual population growth rate has since slowed to 0.7 percent per year, and is anticipated to slow to 0.5 percent by 2025 (Hawaii Department of Business, Economics, and Tourism (HDEBT) 2018, p. 2); however, existing demands for competing resources will persist.

While breeding habitat has some level of protection in national parks, in national wildlife refuges, and on some State lands, there is little to no protection for habitat that nene use outside the breeding season. Nene are vulnerable at this time, as well as during

the breeding season, as they are moving around to different areas, thus being exposed to additional predation in unprotected habitat, poor availability of suitable foraging habitat, and interactions with humans and human structures (wind towers, vehicles, etc.). Human activities associated with the development and urbanization of lowland habitat will continue to impact nene. For example, nene collide with trees, fences, and particularly motor vehicles (Banko and Elder 1990; Banko *et al.* 1999). Nene are attracted to feeding opportunities provided by mowed grass, weeds, and human handouts. Feeding, in particular, makes nene vulnerable to collisions along roadsides as they frequently become tame and unafraid of human activity (Banko *et al.* 1999). Mortality is high in human-modified habitats due to increased predation, collisions, and human-caused accidents (Banko *et al.* 1999).

Feral ungulates and nonnative plants led to degradation of nene habitat by negatively impacting forage quality, shelter, and potential nest sites. Grazing and browsing by introduced cattle, goats, and sheep converted significant portions of native montane forest and shrubland between 1,640 and 6,562 ft (500 and 2,000 m) to wild grassland and managed pastureland dominated by nonnative species (Cuddihy and Stone 1990, pp. 59–63, 63–67). Effects of nonnative ungulates have been somewhat less severe above 6,562 ft (2,000 m) because nonnative weeds are less prevalent (Banko *et al.* 1999, p. 6). Efforts to control feral ungulate populations (*e.g.*, fencing) have been implemented at some sites, including localities in Hawaii Volcanoes and Haleakala National Parks, and have locally reduced ungulate impacts on native vegetation and likely improved nene foraging and breeding habitat. Nonnative plants adversely affect native habitat in Hawaii by: (1) Modifying the availability of light, (2) altering soil-water regimes, (3) modifying

nutrient cycling, and (4) altering fire regimes of native plant communities (*i.e.*, the “grass/fire cycle” that converts native-dominated plant communities to nonnative plant communities) (Smith 1985, pp. 180–181; Cuddihy and Stone 1990, p. 74; D’Antonio and Vitousek 1992, p. 73; Vitousek *et al.* 1997, p. 6). Nonnative ungulates and plants are expected to require continued management into the foreseeable future, if not indefinitely, as the main Hawaiian islands are too large for complete eradication to be feasible with current technology.

Inadequate nutrition limits nene reproduction and gosling survival, especially on Hawaii and Maui (USFWS 2004, pp. 29–30). Proper nutrition is critical for successful reproduction. Breeding females require carbohydrates and protein to increase fat reserves for egg laying and incubation; goslings require high-protein foods for growth and development (Ankney 1984, pp. 364–370; Banko *et al.* 1999, p. 7). Low breeding rates (20 to 63 percent) and low nest success (44 percent) at several sites on Maui and Hawaii from 1979 to 1981 were likely attributable to poor quality or low availability of foods (Banko 1992, pp. 103-104). The high rates of gosling mortality (57 to 81 percent) in Haleakala National Park during the mid-1990s were due to starvation and dehydration (Baker and Baker 1995, p. 2; 1999, p. 12). Between 1989 and 1999, lack of adequate food or water also appeared to be a factor limiting nene recruitment in Hawaii Volcanoes National Park (Rave *et al.* 2005, p. 14). In many instances of gosling mortality, the actual cause of death may be exposure because goslings are weakened by malnutrition (at hatching) and were unable to keep up with parents, and therefore got chilled or overheated and died (Baker and Baker 1999, p. 13). Emaciation was the most common cause of death diagnosed in 71 out of 300 adult and gosling mortalities submitted to the

National Wildlife Health Research Center between 1992 and 2013 for which a cause of death was identified (Work *et al.* 2015, p. 692). More cases of emaciation were diagnosed on Hawaii Island (32), and to a lesser extent on Kauai (21) and Maui (13), perhaps reflecting the rates of hatching and fledgling success and nutritional quality of habitats on the respective islands. Habitat also continues to be reduced due to the spread of unpalatable alien grasses (*e.g.*, guinea grass (*Megathyrsus maximus*), sword grass (*Miscanthus floridulus*)) and other weeds (*e.g.*, koa haole (*Leucaena leucocephala*), lantana (*Lantana camara*)), as this spread diminishes foraging opportunities (Banko *et al.* 1999, p. 23). Therefore, inadequate nutrition due to the lack of suitable foraging opportunities in and around current breeding areas, particularly at higher elevations on Maui and Hawaii Island, coupled with the loss of lowland breeding areas across its range, is expected to continue into the foreseeable future as a threat to the nene.

Drought contributes to nene mortality by reducing the amount and quality of available forage, thereby increasing the starvation and dehydration. For example, nene exhibited higher rates of mortality in drought years during the prolonged island-wide drought between 1976 and 1983 on Hawaii Island (Black *et al.* 1997, pp. 1,165–1,169). Drought was also thought to have contributed to the population decline (10 percent) at Hawaii Volcanoes National Park in the late 1990s (Rave *et al.* 2005, p. 12). Numerous and recurrent droughts have been documented historically throughout the Hawaiian Islands (Giambelluca *et al.* 1991, pp. 3–4; Hawaii Civil Defense 2011, ch. 14, pp. 1–12), with the most severe events often associated with the El Niño phenomenon (Hawaii Civil Defense 2011, p. 14-3). Climate modelling projections indicate that drought frequency and intensity in the Hawaiian Islands are expected to increase over time (Loope and

Giambelluca 1998, pp. 514–515; U.S. Global Change Research Program (US–GCRP) 2009, pp. 10, 12, 17–18, 32–33; Giambelluca 2013, p. 6). Therefore, we expect drought to be an ongoing threat to nene and to increase in frequency and intensity in the foreseeable future.

Many of the areas where nene occur in the wild are afforded some level of habitat enhancement that focuses on increasing the survival and reproduction of nene. Habitat enhancement can include predator control, mowing for conservation management purposes, outplanting, and supplemental feeding. Hawaii Volcanoes National Park has areas where many of these types of enhancement occur. For instance, park staff maintain two predator-resistant, open-topped pens, which are 4 and 5 hectares (10 and 13 acres) in size, as safe-breeding sites with supplemental feed and occasional mowing. In addition, predator control is conducted at key brooding sites, and some areas may be closed to human use during the nene breeding season. The Hawaii Division of Forestry and Wildlife also provides supplemental food for nene populations on Hawaii Island. Haleakala National Park has controlled ungulate populations and horses intermittently grazing in Paliku pasture. Kauai Department of Fish and Wildlife (DOFAW) also has predator control programs and may provide supplemental feed during drought years. Mowing, grazing, and irrigating grass can improve its attractiveness to geese by increasing the protein content (Sedinger and Raveling 1984, p. 302; Woog and Black 2001, pp. 324–328). All of these management actions are considered necessary into the foreseeable future for the sustained and continued recovery of nene. Predation is expected to continue indefinitely as a threat to nene, as the main Hawaiian islands are too large for

complete eradication of predators to be feasible with current technology.

Nene use of highly altered landscapes and nonnative vegetation can significantly contribute to long-term viability of the population. For example, nene on Kauai use primarily lowland areas in highly altered, human-impacted habitats such as pastures, agricultural fields, and golf courses (USFWS 2004, pp. 41–42). Nene have been very successful in these areas, indicating their adaptability to a variety of habitats. Lowlands, however, are often unsuitable because of intense human activity or dense predator populations placing nene at greater risk of predation, and hazardous situations such as habituation to human feeding, vehicle collisions, and golf ball strikes (Natural Resources Conservation Service [NRCS] 2007, p. 7). The recovery of nene is dependent on a variety of habitats ranging from highly altered, managed habitats to habitats consisting of primarily native species, and it may not be feasible to restore habitats to native species in all areas used by nene. Currently, nene are thought to require availability of a diverse suite of food resources that may include both nonnative and native vegetation (Baldwin 1947, pp. 108–120; Black *et al.* 1994, pp. 103–105; Banko *et al.* 1999, pp. 6–7). However, the current amount and distribution of suitable breeding, foraging, and flocking habitat continue to be limiting factors for the nene, and we expect this to be the case into the foreseeable future.

Our analyses of Factor A under the Act include consideration of ongoing and projected changes in climate, and the impacts of global climate change and increasing temperatures on Hawaii ecosystems, all of which are the subjects of active research. Analysis of the historical record indicates surface temperature in Hawaii has been increasing since the early 1900s, with relatively rapid warming over the past 30 years.

The average increase since 1975 has been 0.48 degrees Fahrenheit (°F) (0.27 degrees Celsius (°C)) per decade for annual mean temperature at elevations above 2,600 ft (800 m) and 0.16 °F (0.09 °C) per decade for elevations below 2,600 ft (800 m) (Giambelluca *et al.* 2008, pp. 3–4). Based on models using climate data downscaled for Hawaii, the ambient temperature is projected to increase by 3.8 to 7.7 °F (2.1 to 4.3 °C) over the 21st century, depending on elevation and which of the four Representative Concentration Pathway (RCP) emissions scenarios (RCP 2.6, 4.5, 6, and 8.5) are considered (Liao *et al.* 2015, p. 4344; van Vuuren *et al.* 2011, p.5; Intergovernmental Panel on Climate Change 2014, p. 8). Environmental conditions in tropical montane habitats can be strongly influenced by changes in sea surface temperature and atmospheric dynamics (Loope and Giambelluca 1998, pp. 504–505; Pounds *et al.* 1999, pp. 611–612; Still *et al.* 1999, p. 610; Benning *et al.* 2002, pp. 14,246–14,248; Giambelluca and Luke 2007, pp. 13–15). On the main Hawaiian islands, predicted changes associated with increases in temperature include a shift in vegetation zones upslope, a similar shift in animal species' ranges, changes in mean precipitation with unpredictable effects on local environments, increased occurrence of drought cycles, and increases in intensity and numbers of hurricanes (tropical cyclones with winds of 74 miles per hour or higher) (Loope and Giambelluca 1998, pp. 514–515; U.S. Global Change Research Program (US–GCRP) 2009, pp. 10, 12, 17–18, 32–33; Giambelluca 2013, p. 6). The effect on nene of these changes associated with temperature increase is detailed in the following paragraphs.

Forecast of changes in precipitation are highly uncertain because they depends, in part, on how the El Niño–La Niña weather cycle (an episodic feature of the ocean-atmosphere system in the tropical Pacific having important global consequences for

weather and climate) might change (State of Hawaii 1998, pp. 2–10). The historical record indicates that Hawaii tends to be dry (relative to a running average) during El Niño phases and wet during La Niña phases (Chu and Chen 2005, pp. 4809–4810). However, over the past century, the Hawaiian Islands have experienced a decrease in precipitation of just over 9 percent (U.S. National Science and Technology Council 2008, p. 61) and a decreasing trend (from the long-term mean) is evident in recent decades (Chu and Chen 2005, pp. 4802–4803; Diaz *et al.* 2005, pp. 1–3). Models of future rainfall downscaled for Hawaii generally project increasingly wet windward slopes and mild to extreme drying of leeward areas in particular during the middle and late 21st century (Timm and Diaz 2009, p. 4262; Elison Timm *et al.* 2015, pp. 95, 103–105). Altered seasonal moisture regimes can have negative impacts on plant growth cycles and overall negative impacts on native ecosystems (US–GCRP 2009, pp. 32–33). Long periods of decline in annual precipitation result in a reduction of moisture availability; an increase in drought frequency and intensity; and a self-perpetuating cycle of nonnative plant invasion, fire, and erosion (US–GCRP 2009, pp. 32–33; Warren 2011, pp. 221–226). Overall, more frequent El Niño events are predicted to produce less precipitation for the Hawaiian Islands. These projected decreases in precipitation are important stressors for nene because they experience substantially higher mortality from starvation in drought years (Hess 2011, p. 59). In addition, the drying trend, especially on leeward sides of islands, creates suitable conditions for increased invasion by nonnative grasses and enhances the risk of wildfire.

Tropical cyclone frequency and intensity are projected to change as a result of increasing temperature and changing circulation associated with climate change over the

next 100 to 200 years (Vecchi and Soden 2007, pp. 1068–1069, Figures 2 and 3; Emanuel *et al.* 2008, p. 360, Figure 8; Yu *et al.* 2010, p. 1371, Figure 14). In the central Pacific, modeling projects an increase of up to two additional tropical cyclones per year in the main Hawaiian islands by 2100 (Murakami *et al.* 2013, p. 2, Figure 1d). In general, tropical cyclones with the intensities of hurricanes have been an uncommon occurrence in the Hawaiian Islands. From the 1800s until 1949, hurricanes were reported only rarely. Between 1950 and 1997, 22 hurricanes passed near or over the Hawaiian Islands, and 5 of these caused serious damage (Businger 1998, *in litt.*). A recent study shows that, with a projected shift in the path of the subtropical jet stream northward, away from Hawaii, more storms will be able to approach and reach the Hawaiian Islands from an easterly direction, with Hurricane Iselle in 2014 being an example (Murakami *et al.* 2013, p. 751). At high-elevation nesting sites, frequent heavy precipitation may affect gosling survival during the cooler months (Hess *et al.* 2012, p. 483). More frequent and intense tropical storms are likely to increase the number of nest failures and gosling mortalities in mid- and high-elevation habitats on Maui and Hawaii, where nene are already at risk of exposure and starvation due to inadequate nutrition (Baker and Baker 1995, p. 13; Misajon 2016, pers. comm.; Tamayose 2016, pers. comm.). In addition, projected warmer temperatures and increased storm severity resulting from climate change are likely to exacerbate other threats to nene, such as enhancing the spread of nonnative invasive plants into these species' native ecosystems in Hawaii.

New information received during the comment period revealed that flooding from increased storm frequency and intensity may negatively affect nene viability as past heavy rainfall during the nene breeding season has caused numerous failures of eggs and young

goslings at Hawaii Volcanoes National Park (NPS 2018, *in litt.*). On Kauai, flooding has decreased nest success for the past 2 years (Webber *et al.* 2017, *in litt.*; Uyehara 2018, *in litt.*). In 2017 and 2018, Kauai experienced a record number of flooding events (Uyehara 2018, *in litt.*). Approximately 10 flash floods impacted the Hanalei flood plain through the 2017–2018 breeding season, which hindered breeding activity (Luxner *et al.* 2018, *in litt.*; Uyehara 2018, *in litt.*). Three nene nests were discovered in October 2017, all of which were destroyed the following month by the first flood of the season (Luxner *et al.* 2018, *in litt.*). Most of the active, undiscovered nests established prior to the flood also presumably failed (Luxner *et al.* 2018, *in litt.*). Overall, both the 2016–2017 and 2017–2018 seasons resulted in over 30 percent nest failure as a result of flooding (Webber *et al.* 2017, *in litt.*; Luxner *et al.* 2018, *in litt.*). Many breeding pairs may have failed after the first attempt to nest, may have failed after attempting to re-nest, did not re-nest, or may have moved off the refuge to nest or re-nest (Luxner *et al.* 2018, *in litt.*). Flooding also pushes nene out of their habitat and closer to roads, placing them at risk of vehicular strikes (Webber *et al.* 2017, *in litt.*). Another impact from flooding is an increased subsequent risk of an avian botulism outbreak (Uyehara 2018, *in litt.*).

Finally, sea-level rise resulting from thermal expansion of warming ocean water; the melting of ice sheets, glaciers, and ice caps; and the addition of water from terrestrial systems (Climate Institute 2011, *in litt.*) has the potential for direct effects on nene habitat. Rise in global mean sea level (GMSL) is ongoing and expected to continue (Meehl *et al.* 2012, p. 576; Golledge *et al.* 2015, pp. 421, 424; DeConto and Pollard 2016, pp. 1, 6) due to warming that has already occurred and an uncertain amount of additional warming caused by future greenhouse gas emissions (Sweet *et al.* 2017, p. 1). Six risk-

based scenarios describing potential future conditions through 2100 project lower and upper bounds of GMSL rise between 0.3 and 2.5 m (1 and 8 ft) (Sweet *et al.* 2017, pp. vi–vii, 1–55, and Appendices A–D).

Sea-level rise is not expected to be uniform throughout the world, due to factors including, but not limited to: (1) Variations in oceanographic factors such as circulation patterns; (2) changes in Earth’s gravitational field and rotation, and the flexure of the crust and upper mantle due to melting of land-based ice; and (3) vertical land movement due to postglacial rebound of topographically depressed land, sedimentation compaction, groundwater and fossil fuel withdrawals, and other non-climatic factors (Spada *et al.* 2013, p. 484; Sweet *et al.* 2017, pp. vi–vii, 9, 19). Sea-level rise in the Hawaiian Islands is expected to be greater than the rise in GMSL (Spada *et al.* 2013, p. 484; Polhemus 2015, p. 7; Sweet *et al.* 2017, p. 9), due, at least in part, to gravitational redistribution of meltwater resulting from terrestrial ice melt occurring in Greenland, Antarctica, and other places (Spada *et al.* 2013, p. 484). In Hawaii, long-term sea-level rise adds to coastal erosion, impacts from seasonal high waves, coastal inundation due to storm surge and tsunamis, and drainage problems due to the convergence of high tide and rainfall runoff (SOEST 2017, *in litt.*). Flooding related to sea-level rise would result in the additional loss of lowland habitat occupied by nene in low-lying coastal areas at Huleia NWR on Kauai, Ukumehame on Maui, and Keaau on Hawaii Island.

Thus, although we cannot predict the timing, extent, or magnitude of specific events given that RCP scenarios diverge after around 2035, we expect effects of climate change (changes in tropical cyclone frequency and intensity, drought frequency, and sea-level rise) to exacerbate the current threats to this species such as predation, inadequate

nutrition, and habitat loss and degradation.

During the comment period, we received new information that indicates the recent volcanic activity from Kilauea on the island of Hawaii destroyed portions of nene habitat in Hawaii Volcanoes National Park and some nearby areas. Hawaii Volcanoes National Park is home to approximately one-third of the current statewide nene population. There have been significant changes to the caldera floor and notable deposits of ash in the vicinity of the Kilauea summit and to the southwest (Misajon 2018, *in litt.*). Areas of nene habitat known to be affected include nesting, roosting, and molting sites; however, the extent of affected habitat and the actual impacts to that habitat as a result of the collapses and the ash are not known at this time (Misajon 2018, *in litt.*). The eruption in lower Puna eliminated habitat for a small group of nene that resides in the area (Mello 2018, *in litt.*). Severe, ongoing volcanic eruptions have the potential to destroy much or all of the habitat in Hawaii Volcanoes National Park and surrounding areas that support approximately one-third of the statewide nene population. Fortunately, nene were not nesting or molting during the time period of the eruption. Nene have evolved alongside volcanic activity on the island of Hawaii for centuries, and despite past and present activity, volcanic activity has not been identified as a dominant factor that threatens the survival of the species. Although we have added volcanic activity as a threat under Factor A in this rule, we do not identify volcanic activity as a dominant factor that threatens the survival of the species as there are additional self-sustaining nene populations on the islands of Kauai and Maui. Additionally, in mid-August 2018, Kilauea's activity decreased in some areas and ceased in others. Although initially the recent eruption temporarily altered nene behavior by causing them to spend much more time at Wright Road farms, Volcano Winery,

and Volcano Golf and Country Club, by December 2018, State biologists reported that “business is as usual” for nene in the volcano area (Mello 2018, *in litt.*). Updates have yet to come in for the small coastal population of nene in the Kapoho to Pohoiki area; however, they are assumed to have moved out during the eruption and moved back into the area afterward (Mello 2018, *in litt.*). Volcanic activity has greater potential to bring harm to individual nene if it occurs during breeding or molting seasons, when birds may be flightless. Direct impacts to individual nene will be difficult to assess, and any impacts at the population level will not be immediately apparent (Misajon 2018, *in litt.*). It is impossible to know if the lull in volcanic activity will continue or if Kilauea will increase in activity again in the near future.

Summary of Factor A

Habitat destruction and modification from urbanization, agricultural activities, drought, feral ungulates, and invasive plant species remain threats to nene. Volcanic activity recently impacted nene habitat on the island of Hawaii, but the long-term effects of this activity have yet to be determined. These factors contribute to an ongoing lack of suitable breeding and flocking habitat, limiting nene population expansion. Historical habitat loss was largely a result of human activities such as urban development and land conversion for agricultural activities, particularly in lowland areas, contributing to the extirpation of nene on Kauai and Molokai, and the loss of seasonally important leeward, lowland breeding areas on islands with elevations above 5,000 ft (1,524 m) (Hawaii and Maui). Feral ungulates and invasive plant species led to further degradation of nene habitat by negatively impacting forage quality, shelter, and potential nest sites. Nonnative ungulates and plants are ongoing threats that we expect will continue indefinitely into the

future and require continued management, as the main Hawaiian islands are too large for complete eradication to be feasible.

Recovery efforts initially focused on the establishment of populations, with the majority of releases of captive-bred nene at high-elevation sanctuaries (above 5,000 ft (1,524 m)) on the islands of Maui and Hawaii. Despite supplemental food and water and localized predator control efforts, nene at these sites experienced high rates of adult mortality and low rates of gosling survival that were attributed to inadequate nutrition caused by habitat factors such as poor forage quality, drought, and exposure. Access to managed grassland habitats and habitat enhancement during the breeding season improved foraging opportunities and resulted in increased survival and breeding success. Control of feral ungulate populations in some localities has reduced their impacts on native vegetation and likely improved nene foraging and breeding habitat. Subsequent reintroductions at low- and mid-elevation sites, first on the islands of Kauai and Hawaii, and more recently on eastern Molokai and western Maui, demonstrated the ability of nene to successfully become established in these areas.

Currently, nene are found in a range of habitats from sea level to subalpine areas on the islands of Kauai, Oahu, Molokai, Maui, and Hawaii. Populations are centered around release sites and rely on continued land use protections and habitat management (including predator control) to sustain successful breeding and population numbers in these areas.

Overall, the expansion of existing populations is limited by the lack of suitable breeding and flocking habitat due to continuing urbanization, agricultural activities, and potential conflicts with human activities. Periods of drought are expected to continue and

are likely to be exacerbated by the effects of climate change. To minimize the effects of drought on the food availability and adequate nutrition, habitat enhancement activities to provide foraging opportunities, especially during the breeding season, will need to be maintained. The rise in sea level projected by climate change models (Spada *et al.* 2013, p. 484; Polhemus 2015, p. 7; Sweet *et al.* 2017, p. 9) may threaten any low-lying habitats used by nene. Although the effects of climate change do not constitute a threat to nene at the present, we do expect them to exacerbate the effects of drought and tropical storms, and to constitute a threat in the foreseeable future.

Flooding and volcanic activity are threats to nene; however, neither of these threats is likely to occur across the nene's range in a single event. Flooding may only occur on one island, or impact only one subpopulation on an island, leaving intact the remaining self-sustaining populations on other islands, or other subpopulations on a single island. Similarly, volcanic activity is not a threat to the survival of the species because it is restricted to one island (Hawaii) and self-sustaining nene populations exist on three islands (Hawaii, Kauai, and Maui).

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overuse for commercial, recreational, scientific, or educational purposes is not a threat to the nene. The exploitation of nene for food by Hawaiians and non-Polynesian settlers is believed to have been responsible for substantial population declines in lowland areas, and hunting was a major limiting factor until a hunting ban was passed and enforced in 1907 (Banko *et al.* 1999, p. 23). While the historical effects of overuse were factors that led to the original listing of nene as federally endangered in 1967, current

regulations and enforcement are in place and have proven effective in protecting nene from overuse.

Factor C. Disease or Predation

Disease

Numerous parasites and diseases have been documented in captive and wild nene (van Riper and van Riper 1985, pp. 308, 312, 333; Bailey and Black 1995, p. 62; Work *et al.* 2002, p. 1,040). The primary causes of death to nene from disease have been parasites, bacterial and fungal infection, and, less commonly, avian pox (virus) and avian botulism (Work *et al.* 2015, pp. 690–694). Avian influenza and West Nile virus (WNV), if established, also have the potential to affect the nene population.

Toxoplasma gondii is a protozoan parasite transmitted by cats (*Felis catus*) that has historically caused mortality in native Hawaiian birds, and is the most commonly encountered infectious disease in nene, primarily affecting adult birds (Work *et al.* 2015, p. 691). As herbivores, nene are likely exposed by eating transport hosts such as insects or ingesting oocysts (reproductive phase of the parasite) in contaminated water, soil, or vegetation (Work *et al.* 2016, p. 255). For mortalities attributed to *T. gondii*, the cause of death is typically diagnosed as inflammation or lesions on multiple organs. The detection of *T. gondii* in over 30 percent of feral cats sampled (n=67) at two locations on Mauna Kea, Hawaii Island (Danner *et al.* 2007, p. 316), suggests that exposure to and infection by *T. gondii* is likely to continue and to play a role in mortality of nene. Wild birds infected by *T. gondii* may experience a variety of sublethal effects including weakness, loss of balance, and visual impairment (Dubey 2002, pp. 128-136). Such nonlethal effects may also make nene more susceptible to trauma caused by vehicle collisions; in

other species the prevalence of *T. gondii* infection has been observed to be greater in roadkilled individuals than in the general population (Work *et al.* 2016, p. 256).

Widespread exposure to *T. gondii* was detected in wild birds from Kauai, Maui, and Molokai (21 to 48 percent of birds examined) (Work *et al.* 2016, p. 255). However, the parasite is implicated as the cause of death in a relatively low proportion (4 percent) of the number of nene mortalities between 1992 and 2013 (Work *et al.* 2015, pp. 690–694). This suggests that although exposure to *T. gondii* is widespread and ongoing, the threat of disease caused by *T. gondii* is expected to be low in magnitude and is thus not likely to have population-level impacts on nene into the foreseeable future.

Omphalitis, a bacterial infection of the umbilical stump, has been found to cause mortality in both wild and captive nene goslings (USFWS 2004, p. 34). Diagnosis of omphalitis infection has been documented at low levels (2 percent) (Work *et al.* 2015, supplemental material). We are uncertain as to the impacts on nene into the foreseeable future; however, due to the low incidence, we do not view this a species-level threat.

Avian pox is caused by a virus that causes inflammation of the skin, and in severe cases may result in large scabs that block circulation and lead to the loss of digits or entire limbs or lead to blindness, the inability to eat, or death (USGS-NWHC 2017a, *in litt.*). Pox-like lesions have been reported in adult birds in captivity (Kear and Brown 1976, pp. 133–134; Kear and Berger 1980, pp. 42, 86, 138), and pox scars on many birds in the wild on Hawaii and Maui indicate that avian pox is common, but generally not fatal to nene (Banko *et al.* 1999, pp. 20–21). Avian pox was found in an emaciated bird, but was judged to be a secondary finding (Work *et al.* 2015, p. 693).

Avian malaria is caused by the microscopic parasitic protozoan, *Plasmodium*

relictum. Avian malaria was diagnosed as the cause of death in only 1 out of 300 nene mortalities for which the cause of death was identified (Work *et al.* 2015, supplemental material). Avian malaria has also been reported in at least one wild bird on Maui, but it does not appear that avian malaria is causing significant declines of nene populations (Banko *et al.* 1999, pp. 20–21), nor do we expect it to cause significant declines in the foreseeable future. However, concern about the potential to transfer unique regional strains of avian malaria between islands has resulted in quarantine testing of any nene to be moved inter-island to ensure they are not infected. During the recent Nene Relocation Project, birds from Kauai in which *Plasmodium* was detected were kept on Kauai and not translocated to Maui or Hawaii Island (Kauai Lagoons 2015, *in litt.*).

Avian botulism is a paralytic disease caused by the ingestion of a natural toxin produced by the bacteria *Clostridium botulinum*. Birds either ingest the toxin directly or may eat invertebrates (*e.g.*, non-biting midges, fly larvae) containing the toxin (USGS-NWHC 2017b, *in litt.*). Botulism outbreaks may occur year-round with distinct seasonal patterns based on location (Uyehara 2016b, *in litt.*).

Avian botulism has been found on Kauai, Oahu, Molokai, Maui, and Hawaii Island (USGS-NWHC 2017b, *in litt.*). Avian botulism was diagnosed as the cause of death in only 4 out of 300 nene mortalities for which the cause of death was identified (Work *et al.* 2015, supplemental material). Also, between 2011 and 2015, only 1 percent of the 866 cases of avian botulism involved nene in the Kauai NWR Complex (Uyehara 2016b, *in litt.*). Avian botulism is thought to pose a minor threat to nene because they tend to forage on grasses rather than aquatic invertebrates (Work *et al.* 2015, p. 693). We do not anticipate avian botulism becoming a threat in the foreseeable future.

The spread of avian influenza and WNV in North America has serious implications if either arrives in Hawaii. West Nile virus is transmitted by adults of various species of *Culex* mosquitoes, some of which are present in Hawaii (USGS-NWHC 2017c, *in litt.*). When an infected mosquito bites an animal, the virus enters the animal and infects the central nervous system. West Nile virus causes mortality in domestic geese, with goslings more susceptible than adults (Austin *et al.* 2004, p. 117). In experimentally infected young domestic geese, the New York strain of WNV caused reduced activity, weight loss, abnormal neck and spine posture, and death with accompanying encephalitis and myocarditis (Swayne *et al.* 2001, p. 753). Of the three known cases of nene infected with WNV on the U.S. mainland, all were adults, and one died (Jarvi *et al.* 2008, p. 5,339).

Avian influenza has been reported to cause mortality in naturally infected Canada geese in Asia and Europe (Ellis *et al.* 2004, p. 496; Teifke *et al.* 2007, p. 138). Immunologically naive, juvenile birds are particularly susceptible (Pasick *et al.* 2007, p. 1,827). Migratory birds have been implicated in the long-range spread of highly pathogenic avian influenza (HPAI), a virus (H5N1) from Asia to Europe and Africa. In 2006, the U.S. Departments of the Interior (DOI) and Agriculture (USDA) conducted surveillance for the presence of highly pathogenic avian influenza H5N1 in wild birds in the Pacific islands (American Samoa, Guam, Hawaii, Marshall Islands, Northern Mariana Islands, and Palau) (USGS-NWHC 2017d, *in litt.*). Over 4,000 specimens were collected from waterfowl, shorebirds, and other species from throughout the Pacific, and no highly pathogenic avian influenza was detected (Work and Eismueller 2007, p. 2).

We are uncertain whether or not avian influenza or West Nile virus will be

introduced to Hawaii, and current available data does not include modeling to determine any potential future risk

The Hawaii Field Station of the USGS-NWHC continues to work with wildlife managers to monitor the impact of diseases and other mortality factors on nene and other wildlife populations. Cats are the sole known lifecycle host for the protozoan that causes toxoplasmosis. Ongoing conservation measures in nene breeding areas, such as predator control and predator-proof fences that exclude cats, reduce but do not eliminate the risk of exposure to toxoplasmosis due to the abundance and range of feral cat populations.

Predation

Predation by introduced mammals continues to be a major factor limiting nene breeding success and survival. Predators known to take nene eggs, goslings, or adults include: dogs (*Canis familiaris*), feral pigs (*Sus domesticus*), cats, small Indian mongoose (*Herpestes auropunctatus*), and black, Norway, and Pacific rats (*Rattus rattus*, *R. norvegicus*, and *R. exulans*, respectively) (Hoshida *et al.* 1990, pp. 153–154; Baker and Baker 1995, p. 8; Banko *et al.* 1999, pp. 11–12; Hilton 2016, *in litt.*). In addition, cattle egrets (*Bubulcus ibis*) and barn owls (*Tyto alba*) are suspected to occasionally take goslings. When flightless and during molt, goslings and adults are extremely vulnerable to predation by any of these predators (USFWS 2004, p. 21). Yellow crazy ants (*Anoplolepis gracilipes*), tropical fire ants (*Solenopsis geminata*), and little fire ants (*Wasmannia auropunctata*) also have the potential to disturb incubating females and goslings (Plentovich 2019, *in litt.*).

The small Indian mongoose was introduced to the Hawaiian archipelago in 1883, and quickly became widespread on Oahu, Molokai, Maui, and Hawaii Island, from sea

level to elevations as high as 7,000 ft (2,130 m) (Tomich 1986, pp. 93–94). Kauai remained mongoose-free when a planned introduction was aborted; however, there have been almost 350 reported sightings since 1968, and in 1976, a road-killed, lactating female was found on the island near Eleele (KISC 2016a, *in litt.*; Phillips and Lucey 2016). In 2012 and 2016, a total of three mongooses were captured in Lihue, Kauai, at air cargo and harbor facilities, as well as a resort adjacent to airport property (KISC 2016b, *in litt.*). The numerous sightings and four confirmed individuals have led to the perception that mongoose are now established on Kauai. While the recent arrivals of mongooses are troubling, there remains scant biological evidence that a breeding population of mongoose occurs on Kauai.

Mongoose are believed to be the most serious egg predator responsible for the most nene nest failures on Hawaii and Maui (Hoshida *et al.* 1990, p. 154; Banko 1992, pp. 101–102; Black and Banko 1994, p. 400; Baker and Baker 1995, p. 20). Mongoose also prey upon goslings and adults (Kear and Berger 1980, p. 57; Banko and Elder 1990, p. 122; Misajon 2016, pers. comm.). The success of the nene on Kauai demonstrates that mongoose may constitute the most significant predator elsewhere (Banko *et al.* 1999, p. 25). Despite limited data, recent estimates of nest success on Kauai for private lands (75 percent) and the Kauai NWR Complex (82 percent) are greater than estimates for both Haleakala (62 percent) and Hawaii Volcanoes (58 percent) National Parks (Hu, unpublished as cited in Banko *et al.* 1999; Bailey and Tamayose 2016, *in litt.*; Uyehara 2016a, *in litt.*).

Introduced European pigs hybridized with smaller, domesticated Polynesian pigs; became feral; and invaded forested areas, especially mesic and wet forests, from low to

high elevations, and are present on all the main Hawaiian islands except Lanai and Kahoolawe, where they have been eradicated (Tomich 1986, pp. 120–121; Munro 2007, p. 85). Pigs may roam over nearly the entire extent of the range of nene. Pigs are known to take eggs, goslings, and possibly adults (Kear and Berger 1980, p. 57; Banko and Elder 1990, p. 122; Baker and Baker 1995, p. 20; Misajon 2016, pers. comm.). The presence of pigs can also attract feral dogs that may then prey upon nene (NPS 2016, p. 2).

Three species of introduced rats occur in the Hawaiian Islands. Studies of Pacific rat DNA suggest they first appeared in the islands along with emigrants from the Marquesas Islands (French Polynesia) in about 400 A.D., with a second introduction around 1100 A.D. (Ziegler 2002, p. 315). The black rat and the Norway rat arrived in the islands more recently as stowaways on ships sometime in the late 19th century (Atkinson and Atkinson 2000, p. 25). The Pacific rat and the black rat are found primarily in rural and remote areas of Hawaii in dry to wet habitats, while the Norway rat typically is found in urban areas or agricultural fields (Tomich 1986, p. 41). The black rat is distributed widely throughout the main Hawaiian islands and can be found in a range of ecosystems and as high as 9,000 ft (2,700 m), but it is most common at low- to mid-elevations (Tomich 1986, pp. 38–40). Both black and Pacific rats have been found up to 7,000 ft (2,000 m) on Maui, but the Norway rat has been found only at lower elevations (Sugihara 1997, p. 194). Rats prey upon nene eggs and goslings (Kear and Berger 1980, p. 57; Hoshida *et al.* 1990, p. 154; Baker and Baker 1995, p. 20).

Cats were introduced to Hawaii in the early 1800s, and are present on all the main Hawaiian islands (Tomich 1986, p. 101). Although cats are more common at lower elevations, populations occur in areas completely isolated from human presence,

including montane forests and alpine areas of Maui and Hawaii Island (Lindsey *et al.* 2009, p. 277; Scott *et al.* 1986, p. 363). Cats take nene goslings and adults, and have been observed moving eggs in nests, so they may also prey upon eggs (Kear and Berger 1980, p. 57; Banko and Elder 1990, p. 122; Baker and Baker 1995, p. 20; Zaun 2008, *in litt.*).

Dogs in Hawaii are products of animals brought by Polynesians and later introductions of mixed or selected breeds from all over the world (Tomich 1986, p. 52). Nene are particularly vulnerable to dogs because they have little instinctive fear of them. Along with mongoose, dogs are a significant predator of adult nene, and may also take goslings (Kear and Berger 1980, p. 57; Banko and Elder 1990, p. 122).

Predation by mongoose, pigs, rats, cats, and dogs is expected to continue into the foreseeable future, if not indefinitely. Complete eradication of non-native predators from the main Hawaiian islands is not feasible with current technology

Cattle egrets and barn owls were both introduced into Hawaii in the late 1950s, in an attempt to address agricultural pests on farms and ranches. In Hawaii, cattle egrets are now widespread on all the main islands, as well as on the islands and atolls of the Northwestern Hawaiian Islands. Barn owls occur on all of the main Hawaiian islands in all habitat types, from sea level to upper elevation forests, and in recent years have been sighted with increasing frequency on offshore islets. Barn owls and cattle egrets may also take goslings occasionally (Banko *et al.* 1999, p. 11; Franklin 2016, pers. comm.).

The yellow crazy ant occurs in low- to mid-elevations (less than 2,000 ft (600 m)) in rocky areas of moderate rainfall (less than 100 in (250 cm) annually) (Reimer *et al.* 1990, p. 42). The tropical fire ant is found in drier areas of all the main Hawaiian islands (Wong and Wong 1988, p. 175). Little fire ants have spread across the island of Hawaii

with isolated locations on Kauai, Maui, and Oahu (Lee *et al.* 2015, p. 100). Little fire ants have yet to establish on the islands of Kahoolawe, Lanai, and Molokai (Hawaii Invasive Species Council 2019). All three ant species are nonnative and are known to cause significant injuries and developmental problems in adults and chicks of ground-nesting seabirds, and are expected to have similar effects on nene (S. Plentovich 2019, *in litt.*).

Predation by cattle egrets and barn owls, and disturbance by ants, may result in injury or mortality of nene; however, predation/disturbance by these species occurs infrequently and is not known to have population-level impacts.

A variety of predator control programs have been initiated in areas where nene currently reside. Since 1994, Haleakala National Park has conducted intensive control of introduced predators using trapping and toxicants (Bailey and Tamayose 2016, *in litt.*). Ongoing efforts on the different islands include predator control programs aimed at mongoose, feral dogs, feral cats, rodents, and pigs. Some open-top pens used previously to rear captive nene on National Park Service lands are now used to provide predator-free nesting and brooding habitat for free-flying pairs or as temporary holding pens for sick or injured birds (Hawaii Volcanoes National Park 2016, *in litt.*).

Nene population numbers at Hawaii Volcanoes National Park increased during a 10-year period (1989 to 1999), probably in part because of intensive predator control during that period (Rave *et al.* 2005, p. 14). Since then, ongoing predator trapping focused in the primary breeding and brooding areas at Hawaii Volcanoes National Park during the breeding season has likely contributed to the overall increase in nene observed. The general increase in population at Haleakala National Park over the last 25 years is likely a response to increased habitat management—first, the removal of feral ungulates

and control to near zero populations; later, the additional intensive control of introduced predators (Bailey and Tamayose 2016, *in litt.*). At Hawaii Volcanoes National Park, various fence designs have been used successfully to exclude mongoose, cats, dogs, and pigs. Predator control programs are currently conducted in most areas where nene nest, including Hanalei, Kilauea Point, and Hakalau Forest NWRs; Haleakala and Hawaii Volcanoes National Parks; and Piihola Ranch, Haleakala Ranch (Waiopae), and Puu O Hoku Ranch on Molokai.

While predator control programs have proven effective in localized areas, recovery of nene is dependent on more aggressive and widespread control of introduced predators. Despite documentation of the impact of mongoose, dogs, cats, rodents, and pigs on nene, there are relatively few predator control programs, and they are not being implemented over areas large enough to elicit a population response by native prey species (Scott *et al.* 2001, p. 11). Known control techniques should be applied at all habitats needed to recover nene (USFWS 2004, p. 41).

Summary of Factor C

Diseases such as toxoplasmosis, omphalitis, avian pox, avian malaria, and avian botulism cause low levels of mortality in nene, although without resulting in population-level effects, and are expected to continue to do so indefinitely into the future. Avian influenza and WNV are not currently established in Hawaii, and we have no reliable estimate of the risk of this occurring, but they could cause mortality of nene should they become established. Measures to control feral cat populations would reduce the risk of exposure of nene to toxoplasmosis. Continued monitoring of the occurrence of disease in nene populations, as well as early detection of avian botulism outbreaks or cases of avian

influenza or WNV, should minimize the impacts of these threats.

Predation by introduced mammals is the most serious threat to nene. Predation by mongoose, dogs, cats, rats, and feral pigs continues to affect all life stages of nene (eggs, goslings, and adults), negatively impacting breeding success and survival. Predator control measures have improved survival and reproductive success and contributed to population increases in managed areas. However, these efforts are localized and overall predator populations are not being reduced; therefore, predators can readily recolonize an area. In addition, as nene populations expand into areas in their former historical range, such as lowland areas, they will likely encounter higher predator populations in and around human-occupied urban, suburban, and agricultural areas. Predation by cattle egrets and barn owls, and disturbance by ants, may result in injury or mortality of nene; however, predation/disturbance by these species occurs infrequently and is not known to have population-level impacts. Predation is an ongoing threat that we expect will continue indefinitely into the future and require continued management, as the main Hawaiian islands are too large for complete eradication of nonnative predators to be feasible.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

The following section includes a discussion of Federal, State, and local laws, regulations, or treaties that apply to nene. It includes laws and regulations for Federal land management agencies and State and Federal regulatory authorities affecting land use or other relevant management.

Federal Laws and Regulations

National Wildlife Refuge System Improvement Act of 1997. The National Wildlife

Refuge System Improvement Act of 1997 (Pub. L. 105–57, October 9, 1997) established the protection of biodiversity as the primary purpose of the NWR System. This has led to various management actions to benefit federally listed species, including development of comprehensive conservation plans (CCPs) on NWRs. The CCPs typically set goals and list needed actions to protect and enhance populations of key wildlife species on NWR lands. Where nene occur on NWR lands (Hanalei, Kilauea Point, Hakalau Forest, Kealia Pond, and James Campbell NWRs), their habitats in these areas are protected from large-scale loss or degradation due to the Service’s mission “to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (16 U.S.C. 668dd(a)(2)).

National wildlife refuges must also conduct section 7 consultations under the Act (discussed below) for any refuge activity that may result in adverse effects to nene.

Hanalei NWR was established in 1972, to aid in the recovery of the four endangered Hawaiian waterbirds and nene (Endangered Species Conservation Act of 1969; 16 U.S.C. 668aa *et seq.*). Kilauea Point NWR, established in 1985 to enhance seabird nesting colonies, was later expanded to include adjacent lands to be managed for the protection and recovery of endangered waterbirds and nene (The Kilauea Point National Wildlife Refuge Expansion Act of 2004, Pub. L. 108–481, December 23, 2004; 16 U.S.C. 668dd note). Approximately two-thirds of the Kauai nene population is supported by the Hanalei and Kilauea NWRs. The Kilauea Point CCP includes the following goals: (1) Protect, enhance, and manage the coastal ecosystem to meet the life-history needs of migratory seabirds and threatened and endangered species; (2) restore

and/or enhance and manage populations of migratory seabirds and threatened and endangered species; and (3) gather scientific information (surveys, research, and assessments) to support adaptive management decisions (USFWS 2016, pp. 2:19–31). Both Hanalei and Kilauea Point NWRs conduct ongoing predator control and habitat improvement and enhancement actions.

At Hakalau Forest NWR, a new population was created with the reintroduction of 33 captive-bred nene between 1996 and 2003. Since then, Hakalau Forest NWR has supported approximately 20 to 25 percent of the nene population on Hawaii Island. The Hakalau Forest NWR CCP includes the following goals: (1) Protect and maintain grassland habitat to support nene population recovery; and (2) collect scientific information (inventories, monitoring, research, assessments) necessary to support adaptive management decisions on both units of the Hakalau Forest NWR (USFWS 2010, pp. 2:30-37).

Kealia Pond NWR, on the south-central coast of Maui, was established in 1992, to conserve habitat for the endangered Hawaiian stilt (*Himantopus mexicanus knudseni*) and Hawaiian coot (*Fulica alai*). Nene are occasionally observed at Kealia Pond NWR (USFWS 2011b, p. 4:14).

James Campbell NWR on the northern shore of Oahu was created in 1976, also for the conservation of endangered Hawaiian waterbirds, and later expanded in 2005, to include conservation of additional threatened and endangered species, migratory birds, and their habitats (USFWS 2011c, p. 1:1). In 2014, a pair of nene arrived on Oahu, nested at James Campbell NWR, and produced three offspring. Both parents and one of the offspring have since died, leaving the two remaining offspring on NWR and adjacent

lands.

Hawaii National Park Act of 1916. Congress established Hawaii National Park (later to become, separately, Hawaii Volcanoes National Park and Haleakala National Park) on August 1, 1916 (39 Stat. 432), “for the benefit and enjoyment of the people of the United States” (16 U.S.C. 391) and to provide for, “the preservation from injury of all timber, birds, mineral deposits, and natural curiosities or wonders within said park, and their retention in their natural condition as nearly as possible” (16 U.S.C. 394). Since that time, the enabling legislation of the park has been modified several times, both to establish the national parks on the islands of Hawaii and Maui as separate parks and to expand the boundary of Hawaii Volcanoes National Park. In 1960, Congress authorized the establishment of the Haleakala National Park (Pub. L. 86-744, September 13, 1960); the park was established the following year. Haleakala National Park, on the eastern side of Maui, encompasses 33,222 acres (ac) (13,444 hectares (ha)), of which 24,719 ac (10,003 ha) are designated wilderness (74 percent of the park) (NPS 2018, in litt.). Hawaii Volcanoes National Park protects 330,086 ac (133,581 ha) of public land on Mauna Loa and Kilauea volcanoes on the southeastern side of Hawaii Island (NPS 2017, p. 3). Haleakala National Park (supporting half of the Maui population) and Hawaii Volcanoes National Park (supporting one-third of the statewide population) have conducted nene recovery actions since the 1960s and 1970s, respectively. Past and ongoing actions include releases of captive-bred nene, habitat management (*e.g.*, predator control, feral ungulate control, nonnative plant species control), provision of supplemental food and water, monitoring, and outreach and education.

Migratory Bird Treaty Act (MBTA). Nene are a protected species under the

MBTA (16 U.S.C. 703–712, 50 CFR 10.13), a domestic law that implements the U.S. commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of shared migratory bird resources. The MBTA regulates most aspects of take, possession, transport, sale, purchase, barter, export, and import of migratory birds and prohibits the killing, capturing, and collecting of individuals, eggs, and nests, unless such action is authorized by permit. While the MBTA prohibits actions that directly kill a covered species, unlike the Endangered Species Act (Act), it does not prohibit habitat modification that indirectly kills or injures a covered species, affords no habitat protection when the birds are not present, and provides only very limited mechanisms for addressing chronic threats to covered species, such as nonnative predators

State Laws and Regulations

The Hawaii Endangered Species law (Hawaii Revised Statutes (HRS) 195D) prohibits take, possession, sale, transport, or commerce in designated species. This State law also recognizes as endangered or threatened those species determined to be endangered or threatened pursuant to the Federal Endangered Species Act. This Hawaii law states that a threatened species (under the Act) or an indigenous species may be determined to be an endangered species under State law. Protection of these species is under the authority of Hawaii's DLNR, and under administrative rule (Hawaii Administrative Rules (HAR) 13-124-11). Incidental take of threatened and endangered species may be authorized through the issuance of a temporary license as part of a safe harbor agreement (SHA) or habitat conservation plan (HCP) (Hawaii Revised Statutes (HRS) 195D-21, HCPs; 195D-22, SHAs). Although this State law can address threats such as habitat modification, collisions, and other human-caused mortality through HCPs

that address the effects of individual projects or programs on nene, it does not address the pervasive threats to the nene posed by introduced mammalian predators. DLNR also maintains HAR 13-124-3, which protects indigenous and introduced wildlife, including nene, from take and export out of Hawaii. The importation of nondomestic animals (including microorganisms) is regulated by a permit system (HAR 4-71) managed through the Hawaii Department of Agriculture (HDOA), reducing the likelihood of introducing new predators or new diseases that may adversely impact nene. The HDOA's Board of Agriculture maintains lists of nondomestic animals that are prohibited from entry, animals without entry restrictions, or those that require a permit for import and possession. The HDOA requires a permit to import animals, and conditionally approves entry for individual possession, businesses (*e.g.*, pets and resale trade, retail sales, and food consumption), or institutions.

Under statutory authorities provided by HRS title 12, subtitle 4, chapter 183D Wildlife, the DLNR maintains HAR title 13, chapter 124 (2014), which defines, at section 13-124-2, "injurious wildlife" as "any species or subspecies of animal which is known to be harmful to agriculture, aquaculture, indigenous wildlife or plants, or constitute a nuisance or health hazard and is listed in the exhibit entitled "Exhibit 5, Chapter 13-124, List of Species of Injurious Wildlife in Hawaii." Under HAR section 13-124-3(c), "no person shall, or attempt to: (1) Release injurious wildlife into the wild; (2) transport live injurious wildlife to islands or locations within the State where they are not already established and living in a wild state; or (3) export any such species, or the dead body or parts thereof, from the State." Permits for these actions may be considered on a case-by-case basis. The small Indian mongoose, a serious predator of nene, is included in Exhibit

5, chapter 13-124, List of Species of Injurious Wildlife in Hawaii. While this HAR may address intentional attempts to transport or release mongoose, there is evidence that inspection and biosecurity measures at inter-island ports may not adequately address their unintentional introduction (*e.g.*, as stowaways in cargo) to islands such as Kauai and Lanai that are thought to be mongoose-free. Currently, there is no biosecurity at Honolulu ports focused on mongoose. Similarly, there is no interdiction being conducted on Lanai for mongoose. At Nawiliwili Harbor (Kauai), the Department of Health is actively implementing a mongoose detection program and has been for the past 2 years (Cecconi, 2019, pers. comm.). In 2016, Governor Ige finalized the Hawaii Interagency Biosecurity Plan 2017–2027. This plan outlines the myriad biosecurity threats (*e.g.*, mongoose and other harmful nonnative animals, diseases, and nonnative plants) in Hawaii and provides broad-scale solutions, including inspections at all air and sea ports to prevent inter-island, interstate, and international spread of invasive species. As of December 2018, all inspector positions were staffed; however, even with full staffing, only 1 to 5 percent of containers can be inspected (Ige 2018, *in litt.*).

Predation by mongoose is a serious threat to nene (see Factor C discussion, above). Currently, the nene population on Kauai represents approximately 43 percent of the total statewide population. Establishment of a breeding population of mongoose on Kauai would significantly reduce the survival and reproduction of nene on Kauai, and as a result, significantly increase the risk of extinction of nene. Although, based on limited data, nene nesting success estimates on unmanaged lands on Kauai (*i.e.*, no predator control) are higher than on managed lands on Maui and Hawaii, this difference may indicate the additional impact of nest predation by mongoose on other islands, which are

not found on Kauai (Amidon 2017).

Critical biosecurity gaps that reduce the effectiveness of animal introduction controls include inadequate staffing, facilities, and equipment for Federal and State inspectors devoted to invasive species interdiction (Hawaii Legislative Reference Bureau 2002; USDA-APHIS-PPQ 2010; Coordinating Group on Alien Pest Species (CGAPS) 2009). In recognition of these gaps, a State law has been passed that allows the HDOA to collect fees for quarantine inspection of freight entering Hawaii (Act 36 (2011) HRS 150A-5.3). Hawaii legislation enacted in 2011 (House Bill 1568) requires commercial harbors and airports to provide biosecurity and inspection facilities to facilitate the movement of cargo through ports. This bill is a significant step toward optimizing biosecurity capacity in the State, but its effectiveness into the future will be dependent on adequate funding. In response to House Bill 1568, and other pressures resulting from the unintentional introduction of invasive nonnative species, the State presented the Hawaii Interagency Biosecurity Plan (2017) is a 10-year strategy that addresses Hawaii's most critical biosecurity gaps and provides a coordinated interagency path that includes policies and implementation tasks in four main areas: (1) Pre-border; (2) border; (3) post-border; and (4) education and awareness. Overall, there is an ongoing need for all civilian and military port and airport operations and construction to implement biosecurity measures in order to prevent the introduction or inter-island transportation of additional predators and diseases that could impact nene.

Feral pigs pose the threat of predation to nene (see Factor C discussion, above). The State provides opportunities to the public to hunt game mammals (ungulates, including feral pigs) on 91 State-designated public hunting areas (within 45 units) on all

the main Hawaiian islands except Kahoolawe and Niihau (HAR-DLNR 2010; see HAR title 13, chapter 123; DLNR 2009, pp. 28–29). The State’s management objectives for game mammals range from maximizing public hunting opportunities (*i.e.*, “sustained yield”) in some areas to removal by State staff or their designees from other areas (HAR-DLNR 2010; see HAR title 13, chapter 123; DLNR 2009, pp. 28–29). Nene populations exist in areas where habitat is used for game enhancement and game populations are maintained at levels for public hunting (HAR-DLNR 2010; see HAR title 13, chapter 123; see Nene Use Area Maps in USFWS 2017). Public hunting areas are defined, but not fenced, and game mammals have unrestricted access to most areas across the landscape, regardless of underlying land-use designation. While fences are sometimes built to protect certain areas from impacts of game mammals, the current number and locations of fences are not adequate to address the threat of habitat degradation and predation on the nene in unfenced areas throughout its range. There are no other State regulations than those described above that address protection of nene and their habitat from feral pigs.

Local Mechanisms

Local groups are working to implement actions urgently needed to address the importation of nonnative, invasive species. We discuss the primary groups below.

The Coordinating Group on Alien Pest Species (CGAPS), a partnership of managers from Federal, State, County, and private agencies and organizations involved in invasive species work in Hawaii, was formed in 1995, in an effort to coordinate policy and funding decisions, improve communication, increase collaboration, and promote public awareness (CGAPS 2009). This group facilitated the formation of the Hawaii Invasive Species Council (HISC), which was created by gubernatorial executive order in

2002, to coordinate local initiatives for the prevention of introduction, and for control, of invasive species by providing policy-level direction and planning for the State departments responsible for invasive species issues (CGAPS 2009). In 2003, the Governor signed into law Act 85, which conveys statutory authority to the HISC to continue to coordinate approaches among the various State and Federal agencies, and international and local initiatives, for the prevention and control of invasive species (DLNR 2003, p. 3-15; HISC 2009, *in litt.*; HRS 194-2). Reduced funding beginning in 2009 restricted State funding support of HISC, resulting in a serious setback of conservation efforts (HISC 2009, *in litt.*; 2015, *in litt.*) and increasing the likelihood of new invasive plants and animals becoming established in nene habitat.

The Hawaii Association of Watershed Partnerships (HAWP) comprises 11 separate partnerships on six Hawaiian Islands. These partnerships are voluntary alliances of public and private landowners, “committed to the common value of protecting forested watersheds for water recharge, conservation, and other ecosystem services through collaborative management” (HAWP 2019, entire). Funding for the partnerships is provided through a variety of State and Federal sources, public and private grants, and in-kind services provided by the partners and volunteers. However, since 2009, decreases in contributed funding have limited the positive contributions of these groups to implementing the laws and rules that can protect and control threats to nene.

These three partnerships, CGAPS, HISC, and HAWP, are collaborative measures that attempt to address issues that are not resolved by individual State and Federal agencies. The capacity of State and Federal agencies and their nongovernmental partners in Hawaii to provide sufficient inspection services, enforce regulations, and mitigate or

monitor the effects of nonnative species is limited due to the large number of taxa currently causing damage (CGAPS 2009). Many invasive, nonnative species established in Hawaii currently have limited but expanding ranges, and they cause considerable concern. Resources available to reduce the spread of these species and counter their negative effects are limited. Control efforts are focused on a few invasive species that cause significant economic or environmental damage to commercial crops and public and private lands. Comprehensive control of an array of nonnative species and management to reduce disturbance regimes that favor them remain limited in scope. If current levels of funding and regulatory support for control of nonnative species are maintained, the Service expects existing programs to continue to exclude, or, on a very limited basis, control these species in only in the highest priority areas. Threats from established nonnative species to nene are ongoing and are expected to continue into the future.

Summary of Factor D

Based on our analysis of existing regulatory mechanisms, there is a diverse network of laws and regulations that provide some protections to the nene and its habitat. Nene habitat that occurs on NWRs is protected under the National Wildlife Refuge System Improvement Act of 1997 and section 7 of the Endangered Species Act. Nene habitat is similarly protected on lands owned by the National Park Service. Additionally, nene receive protection under State law in Hawaii.

As a conservation-reliant species, nene are expected to require ongoing management to address the ongoing threat of predation by introduced mammals such as mongoose, dogs, cats, rats, and pigs (Factor C). Although State and Federal regulatory mechanisms have not prevented the introduction into Hawaii of nonnative predators or

their spread between islands, with sustained management commitments, these mechanisms could be an important tool to ameliorate this threat.

On the basis of the information provided above, existing State and Federal regulatory mechanisms are not preventing the introduction of nonnative species and pathogens into Hawaii via interstate and international pathways, or via intrastate movement of nonnative species between islands and watersheds. These mechanisms also do not adequately address the current threats posed to the nene by established nonnative species. However, with sustained management commitment, these mechanisms could be tools to ameliorate these threats.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Low Genetic Variation

Nene went through a prehistoric population bottleneck and have very low genetic diversity (Paxinos *et al.* 2002, p. 1,827; Rave *et al.* 1999, p. 40; Veillet *et al.* 2008, pp. 1,158–1,160). Low levels of genetic diversity have been found in wild and captive nene populations, and there is some evidence that fertility and gosling survival have declined in captivity as inbreeding has increased (Rave *et al.* 1994, p. 747; Rave 1995, p. 87, Rave *et al.* 1999, p. 40). A condition known as “hairy-down” caused by a recessive gene, which creates a cottony appearance and impairs cold resistance in goslings, has been observed in captive and wild nene (USFWS 2004, pp. 33–34); such goslings observed in the wild at Hawaii Volcanoes National Park have not survived (Misajon 2017, pers. comm.).

Nene on Kauai have less genetic variation than birds sampled from six wild populations on Hawaii, Maui, and Kauai (Rave 1995, p. 87). Despite low genetic diversity and high levels of inbreeding, nene numbers have increased dramatically on

Kauai. Thus, low genetic variation may not be a factor limiting reproductive success of the nene on Kauai (Rave 1995, p. 88).

Wind Energy Facilities

A significant number of nene mortalities have been reported at wind energy facilities. Nene collide with the towers or blades of wind turbine generators (WTGs). The diameter of rotor blades (approximately 330 ft (100 m)) and combined height of WTGs (up to 428 ft (131 m)) create large obstacles for nene during flight. On Maui, three facilities with a total of 40 WTGs are in operation, Kaheawa Wind Power I (20 WTGs) and Kaheawa Wind Power II (12 WTGs) in western Maui, and Auwahi Wind (8 WTGs) in southeastern Maui. From 2006 to 2016, a total of 26 nene fatalities and an adjusted take of 50 nene have been reported at the three Maui wind energy facilities (DOFAW 2016, *in litt.*). Take is adjusted by adding estimates of take undetected by search efforts, indirect take (*e.g.*, eggs or goslings taken by parental deaths in the current year), and lost productivity in future years. All three Maui facilities have approved habitat conservation plans (HCPs) and have received Federal incidental take permits and State incidental take licenses authorizing the total combined take of 95 nene during the 20-year period of operation for each project. The HCPs include the following conservation measures to offset the amount of authorized take: (1) Establish an additional population of 75 nene at an off-site location (Haleakala Ranch); (2) conduct predator control and habitat enhancement at the additional population site; (3) conduct on-site habitat restoration; (4) conduct on-site monitoring of nene; and (5) fund nene conservation actions at Haleakala National Park (DOFAW 2016, *in litt.*).

On Hawaii Island, three facilities with a total of 35 WTGs are in operation at Hawi

(16 WTGs), South Point (14 WTGs), and Lalamilo Wind Farm (5 WTGs); however, there are no reports of nene being killed at these facilities (Sether 2019, pers. comm.). Based on the proximity of these facilities to areas used by nene, there is the potential for collisions. On Oahu, a total of 42 WTGs are in operation at Kawaihoa Wind Power (30 WTGs) and Kahuku Wind Power (12 WTGs), and an additional 9 to 10 WTGs are proposed at the Na Pua Makani project in the Kahuku area. Na Pua Makani has submitted a draft HCP and requested incidental take for nene due to the proximity of the proposed wind energy project to James Campbell NWR, where nene have been observed frequently. Based on the recent occurrence of only two individuals, which failed to breed successfully in 2016, wind energy facilities on Oahu are not a current threat, but represent a potential future threat should a breeding population of nene become established. We are uncertain regarding any future impacts to nene's viability from wind turbines; however, we and the State will be monitoring and regulating wind farm activity through HCPs.

Human Activities

Nene are attracted to feeding opportunities provided by mowed grass and human handouts, and can become tame and unafraid of human activity, making them vulnerable to the impacts of various human activities. These activities include direct harm, such as that caused by vehicles and golf ball strikes, as well as possible disturbance by hikers, hunters, and other outdoor recreationists (Banko *et al.* 1999, pp. 23–24; Rave *et al.* 2005, p. 12; USFWS 2011a, p. 11; Hawaii Volcanoes National Park 2015, *in litt.*; Mello 2017, *in litt.*). Nene may also be impacted by human activities through the application of pesticides and other contaminants, ingestion of plastics and lead, collisions with stationary or moving structures or objects, entanglement in artificial hazards (*e.g.*, fences,

fishing nets, erosion control material), disturbance at nest and roost sites, and mortality or disruption of family groups through direct and indirect human activities (Banko *et al.* 1999, pp. 23–24; USFWS 2004, pp. 30–31; Work *et al.* 2015, pp. 692–693). We anticipate impacts from human activities to continue into the foreseeable future.

Vehicle Collisions

Vehicle collisions are an ongoing cause of nene mortality (Hoshida *et al.* 1990, p. 153; Rave *et al.* 2005, p. 15; Work *et al.* 2015, pp. 692–693). In many areas, nene habitat is bisected by roads, with nesting and roosting on one side, and foraging on the other side. This poses a serious threat, particularly during the breeding season, when adults walk goslings across roads. The greatest number of vehicle collisions occurs between December and April, during peak breeding and molting season. During this time of year, both adults and goslings are flightless for a period of time and are especially vulnerable. The problem is worse in areas where birds are attracted to handouts by visitors and the young shoots of recently manicured or irrigated lawns of roadsides and golf courses. Nene are often seen foraging along the edges of highways and ditches as a result of regular mowing and runoff from the pavement creating especially desirable grass in these areas. The impact is further exacerbated when, after a nene is killed on a road, the remaining family members are often unwilling to leave the body, resulting in multiple birds being killed over a short period of time (DLNR 2016, *in litt.*) and potential loss of future reproductive output from breeding pairs.

In the past, a number of mortalities caused by vehicle collisions were reported in Hawaii Volcanoes (41) and Haleakala (14) National Parks (USFWS 2004, pp. 30–31; Rave *et al.* 2005, p. 12). More recent data indicate this is an ongoing issue both inside

and outside park boundaries on Maui and Hawaii Island; the average annual number of nene killed by cars at Haleakala National Park was 1.2 ± 1.2 (from 1988 to 2011), and occurred at an average annual rate of 3 ± 2.39 at Hawaii Volcanoes National Park and an adjacent State highway (from 2009 to 2016) (Bailey and Tamayose 2016, *in litt.*; Misajon 2017, *in litt.*). Mortality of nene due to vehicle collisions has also been a continual problem on Kauai (Uyehara 2016c, *in litt.*). Over 50 nene were struck and killed by cars across the roadways of Kauai in 2 years (Kauai DOFAW 2016, *in litt.*). On Kauai, typically the majority of vehicle strikes occur in Hanalei and Kilauea, where the largest proportion of the Kauai population occurs; however, the most recent strikes are occurring on the western side of the island.

The National Park Service (NPS) is actively implementing aggressive traffic-calming measures (Haleakala National Park 2014, *in litt.*; USFWS 2016, *in litt.*). A press release is sent out at the beginning of the nesting season, asking park visitors to drive carefully. Posters are displayed at car rental agencies asking visitors to drive carefully when visiting the park. “Nene Crossing” postcards with “Slow Down” messages in different languages are handed out to vehicles entering the park. Cones, signs, and a radar trailer are placed along roadsides where nene are frequently seen. Permanent “Nene Crossing” signs alert drivers to the potential for birds in the primary area(s) of concern, and temporary crossing signs are deployed when birds are observed frequenting specific road side sites. The NPS conducts regular outreach and education to raise visitor awareness of nene near roads. The Kauai DOFAW conducts educational outreach and has signs placed to encourage driving at reduced speeds. The conservation measures reduce but do not eliminate the threat of vehicle collisions.

Natural and Artificial Hazards

Nene can become entangled or trapped in artificial hazards (*e.g.*, old grass-covered fence wire; fishing line, predator traps; spilled tar) and some natural hazards (lava tube openings or deep depressions in ash deposits) (Banko *et al.* 1999, p. 24). Goslings occasionally drown in stock ponds, water troughs, and other water sources where exit to land is difficult (Banko *et al.* 1999, p. 24). Predator traps outfitted with protective guards have been effective at reducing the incidence of injury to goslings (NRCS 2007, p. 6).

The use of certain fencing and erosion control materials has resulted in entanglement of nene with the potential to cause impaired movement, injury, and in some cases mortality. Over 2 years, a total of 44 nene (27 adults and 17 hatch-year birds) in the Poipu/Koloa population on Kauai have been observed with woven threads from erosion control slope matting wrapped around their legs at a single construction site (Kauai DOFAW 2016, *in litt.*). Once the material is wrapped around their legs, nene have an increased risk of becoming entangled with other objects, experiencing skin lacerations, and having the circulation cut from their legs leading to infection and the death of the limb (Kauai DOFAW 2015, *in litt.*). Not all instances of entanglement result in harm to nene, as birds may free themselves from threads. Nine of the 44 entangled nene have been observed with constriction or swelling on their legs; 3 have received rehabilitation and been released; and 1 was euthanized due to injuries sustained from the material. Kauai DOFAW is working with the landowners to minimize impacts and has recommended that the use of this type of erosion control matting be discontinued.

Summary of Factor E

As nene populations continue to recover and increase in number and range, they

will be subject to increased human interactions in and around urban, suburban, agricultural, and recreational areas. Vehicle collisions are an ongoing cause of nene injury and mortality; however, we do not have evidence that this factor is limiting population sizes. We acknowledge that increasing nene population sizes could result in increased mortality rates in the future, especially for those populations near areas with human presence. While vehicle collisions could potentially impact certain populations, they do not constitute a threat to the entire species now, and we do not expect them to be a threat in the foreseeable future. Artificial hazards that result in entanglement or drowning occur at low frequency and thus are not expected to result in population-level impacts. Collisions at wind energy facilities will result in take of nene now and in the foreseeable future; however, conservation measures in approved and permitted HCPs are expected to offset any population-level impacts to the species. While nene exhibit low levels of genetic variation, this does not appear to be a factor limiting reproductive success.

Overall Summary of Factors Affecting Nene

The current statewide nene population estimate is 3,252 birds (in comparison to an estimated 2,855 birds in 2015, as reported in the proposed rule (NRAG 2017; DLNR 2018, *in litt.*), and fewer than 300 birds at the time of listing in 1967 (USFWS 2004, pp. 110-112). The population on Kauai, most recently estimated at 1,482 birds, is stable and increasing, sustained by ongoing predator control and habitat management (NRAG 2017; DLNR 2018, *in litt.*). Nene on Kauai exhibit successful breeding, likely due to abundant food in managed grasslands and the absence of mongoose, which are a significant nest predator on other islands. Between 2011 and 2016, 646 nene were relocated from Kauai to Maui (48) and the island of Hawaii (598). Our current population estimate of nene on

Kauai does not include birds that have been translocated from Kauai to other islands. The Kauai population is expected to continue to exhibit an increasing trend provided no significant nest predators are introduced to the island.

On Maui, the current population estimate is 627 (including translocated birds), with approximately half of the population in Haleakala National Park, and the remainder distributed across areas of western Maui, southern Maui, and the northwestern slopes of Haleakala. The population at Haleakala National Park shows a general increasing trend with numbers consistently above 200 birds since intensive habitat management (feral ungulate and predator control) measures were initiated in the 1990s.

On the island of Hawaii, the current population estimate is 1,091, which includes 598 birds relocated from Kauai (NRAG 2017; DLNR 2018, *in litt.*). Prior to the addition of nene from Kauai, population estimates on the island of Hawaii ranged between 331 and 611, and in general show an increasing trend during the 10-year period since the last major release of 53 birds in 2001. For many years, the largest population of nene on the island of Hawaii has occurred in Hawaii Volcanoes National Park. Over the last 10 years, population estimates at Hawaii Volcanoes National Park have remained relatively constant (ranging between 200 and 250 birds), sustained by ongoing predator control and habitat management. The second subpopulation on the island of Hawaii is found at Puu Oo (NPS 2018, *in litt.*).

On Molokai, the current population estimate of 37 (NRAG 2017; DLNR 2018, *in litt.*) is down from an estimate of 78 in 2015, likely due to predation (Franklin 2017, *in litt.*). While nene on Molokai have bred successfully, periodically low fledging success has been reported due to the high mortality of nestlings, possibly due to overcrowding at

the release site. Estimates of the population on Molokai have fluctuated widely since the reintroduction of 74 birds was completed in 2004.

Nene are considered a conservation-reliant species, especially on the islands of Maui and Hawaii, where populations are spread across a large area and exposed to ongoing threats of predation and habitat loss (development, feral ungulates, nonnative plants) (Reed *et al.* 2012, p. 888). At a minimum, current management levels must be continued to sustain current population trends.

Threats to nene from habitat destruction or modification (Factor A) remain and will likely continue into the foreseeable future in the form of urbanization, agricultural activities, habitat alteration by feral ungulates and nonnative plants, drought, floods, and volcanic activity. These factors contribute to a lack of suitable breeding and flocking habitat and, in combination with predation (Factor C) and other human activities that cause mortality (Factor E), continue to threaten nene and limit expansion of nene populations. Some habitats are expected to be affected by habitat changes resulting from the effects of climate change (Factor A). Overutilization (Factor B) is no longer a threat. Diseases (Factor C) such as toxoplasmosis, avian malaria, omphalitis, and avian botulism are not currently known to contribute significantly to mortality in nene. Thus, we do not consider disease to be a current threat, although novel diseases such as West Nile virus could become a threat if introduced to Hawaii in the future. Predation (Factor C) by introduced mammals, including mongoose, dogs, cats, rats, and pigs, is a significant limiting factor for nene populations now and into the foreseeable future. Therefore, we consider predation to be a threat. Existing regulatory mechanisms, including those to prevent predation, will be an important component of ongoing management of nene as a

conservation-reliant species, but do not currently adequately ameliorate threats and will require a continuing commitment to implementation (Factor D). Human activities such as vehicle collisions, artificial hazards, and other human interactions (Factor E) continue to result in injury and mortality; while the individual impacts of these hazards do not constitute threats with population-level impacts to nene, they collectively and in combination with other factors (Factors A, C, and D) constitute an ongoing threat. Similarly, loss of individuals from flooding and volcanic activity (Factor E) do not independently constitute a threat with species-level impacts. However, if they occur in combination with other factors, the cumulative impacts constitute an ongoing threat.

Summary of Comments and Recommendations

In the proposed rule that published on April 2, 2018 (83 FR 13919), we requested that all interested parties submit written comments on the proposal by June 1, 2018. We also contacted appropriate Federal and State agencies, scientific experts, Native Hawaiian organizations, and other interested parties and invited them to comment on the proposal. Newspaper notices inviting general public comments were published in the Honolulu Star Advertiser, West Hawaii Today, Hawaii Tribune Herald, The Garden Isle, The Maui News, and The Molokai Dispatch newspapers. We did not receive any requests for a public hearing.

We received a total of 36 comment letters on the proposed nene downlisting and associated 4(d) rule. Two of these comment letters were from a peer reviewer, 7 from Federal agencies, 6 from State agencies, and 21 from the general public. All new substantive information has either been incorporated directly into this final rule or is addressed below. All public and peer review comments are available at

<http://www.regulations.gov> (Docket No. FWS–R1–ES–2017–0050) and from our Pacific Islands Fish and Wildlife Office by request (see **FOR FURTHER INFORMATION CONTACT**).

Peer Review

In accordance with our policy, “Notice of Interagency Cooperative Policy for Peer Review in Endangered Species Act Activities,” published on July 1, 1994 (59 FR 34270), we solicited expert opinion from nine knowledgeable individuals with scientific expertise that included familiarity with nene and their habitat, biological needs, and threats. We received a response from one peer reviewer.

Peer Review Comments

(1) *Comment:* While low genetic variation in nene on Kauai does not appear to affect their fitness, this should not be assumed to be true for the species as a whole. Further, fitness on Kauai might be even higher if there was more genetic variation. It is hard to predict the consequences of bottlenecks, low genetic variation, and inbreeding. One consequence of a loss of overall genetic variation is often a loss of variation in important immune system genes, which makes low variation and inbred populations more susceptible to invasive disease (including epidemics and massive die-offs). Although the peer reviewer believes that the low genetic variation and inbreeding are not likely the dominating factors threatening nene population numbers (compared to for example, mongoose and other introduced predators), the peer reviewer thinks this section oversimplifies the potential threats of these factors to nene.

Our Response: We agree that it is important to track genetic diversity and implement conservation efforts that enable nene populations across the species’ range to

maximize genetic diversity. We also concur that low genetic variation and inbreeding, although threats, are not the dominating factors limiting nene population numbers. As we stated in the April 2, 2018, proposed rule, nene went through a prehistoric population bottleneck and have since had very low genetic diversity (Paxinos *et al.* 2002, p. 1,827; Rave *et al.* 1999, p. 40; Veillet *et al.* 2008, pp. 1,158–1,160). We recognize that populations with low genetic variability have increased susceptibility to disease (*e.g.*, West Nile virus, avian influenza). However, despite Kauai having the lowest level of genetic diversity and high levels of inbreeding, nene numbers have increased dramatically on Kauai. Additionally, we believe that having breeding populations on three separate islands provides a potential buffer should a lethal disease such as West Nile virus be introduced. Our analysis also considers that there may be an opportunity for nene to increase genetic diversity: the establishment of traditional movement patterns on Hawaii Island may provide opportunities for greater genetic exchange if pair bonds are formed between individuals from separate breeding subpopulations at non-breeding locations (Hess *et al.* 2012, pp. 479, 482 and Leopold and Hess 2014, pp. 73–74). Although we do not have specific data to support this hypothesis, we find it a reasonable assumption based on recent population genetics research. For example, genetic variation can occur over time when closely associated subpopulations occupy habitats with varying physical and biological elements within the same geographic area (Kristensen *et al.* 2018, pp. 1346–1347).

(2) *Comment:* Downlisting the nene, which is a uniquely adapted Hawaiian goose (and the only remnant species of a small *Branta* radiation in the islands), would reduce their standing for conservation mitigation and increase the likelihood of take. Therefore,

if the downlisting proceeds, it should be accompanied by stringent adherence to regulations protecting the species.

Our Response: We are aware of the perception that conservation benefits afforded to nene would be reduced as a result of this reclassification and associated 4(d) rule. However, the combined purpose of these rules is to provide nene continued protection while facilitating conservation of nene and expansion of their range by increasing flexibility in management activities. As nene increase in number and range, they face increased interaction and potential conflict with the human environment. The exceptions from section 9 of the Act that are outlined in this final 4(d) rule are intended to decrease human-wildlife conflict while ensuring nene have the protections they need in order to continue their path toward recovery.

Upon the effective date of this reclassification and associated 4(d) rule (see **DATES**, above), nene will still be afforded protections under the Act. With the exception of the explicitly limited actions that are covered under the 4(d) rule, anyone taking, attempting to take, or otherwise possessing a nene, or parts thereof, in violation of section 9 of the Act will still be subject to a penalty under Federal law (see section 11 of the Act). This final rule does not alter the requirements of section 7 of the Act or the interagency regulations implementing section 7 that are found at 50 CFR part 402. Under section 7 of the Act, Federal agencies must still continue to ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of nene. Under 50 CFR 402.14, a Federal agency still needs to consult with the Service if the proposed action may affect nene, unless the agency determines with written concurrence from the Service that the proposed action is not likely to adversely affect the nene.

Although the 4(d) rule allows for select exceptions of take from the section 9 prohibitions of the Act, as outlined under the **4(d) Rule**, below, this rule only addresses Federal Endangered Species Act requirements, and does not change the Hawaii Endangered Species Law. Current State of Hawaii (HRS section 195D-4) law does not include the authority to issue regulations, equivalent to those under section 4(d) of the Act, to except take prohibitions for endangered and threatened species. Instead, State law requires the issuance of a temporary license for the take of endangered and threatened animal species, if the activity otherwise prohibited is for scientific or conservation purposes or incidental to an otherwise lawful activity. Please see the **4(d) Rule**, below, for more details on State law and associated requirements (*e.g.*, license, permit, safe harbor agreement, habitat conservation plan). Please also see our responses to related comments (5), (6), (15), and (24).

Federal Agency Comments

(3) *Comment:* The U.S. Department of Agriculture, National Resources Conservation Service (NRCS) commented that the participation of private landowners is considered essential to the recovery of nene, especially on Kauai, where there is limited habitat on Federal land. Privately held ranches on islands of Molokai, Maui, and Hawaii have stepped forward to support recovery of nene, and this should be recognized and supported. These private landowners are being affected by the expansion and dispersal of the nene populations and improving communication and developing partnerships with private landowners are proven means to maximize opportunities for success.

Our Response: We agree that developing and maintaining partnerships, especially with private landowners, is essential to the successful recovery of nene. We greatly

appreciate the efforts made by privately held ranches on Hawaii, Maui, and Molokai. We plan to continue to work with these conservation champions and look forward to strengthening these partnerships to maximize conservation success.

(4) *Comment:* The NRCS commented that the recent gains in the statewide nene population as a whole appear strongly tied to the productivity of the Kauai population. The lack of mongoose on Kauai is a major factor in this population's success. They encourage a coordinated and sustained effort to increase both island biosecurity and eradication response to ensure mongoose do not become established on Kauai.

Our Response: We agree that the success of nene on Kauai is a major factor in the species overall trajectory toward recovery and that the potential establishment of mongoose on Kauai poses a serious threat to the island's nene population. We are involved in ongoing, coordinated efforts to increase biosecurity on Kauai as well as improve eradication efforts, and we welcome partnerships that will further these efforts. In 2016, the Service released the Kauai Mongoose Standard Operating Procedures to Conduct an Island-wide Status Assessment and Early Detection Rapid Response (Phillips and Lucey 2016, pp. 1–12, Appendices A and B).

(5) *Comment:* The NRCS commented that the 4(d) rule is an important mechanism for providing the regulatory assurance needed to successfully implement the voluntary Working Lands for Fish and Wildlife (WLFW) program in Hawaii, as it may provide provisions to ensure that private landowners and citizens are not disproportionately burdened by regulations that do not further the conservation of the species and are excepted from the “take” prohibitions. The WLFW is a collaborative effort between NRCS, the Service, and other conservation partners to provide technical

and financial support to help private landowners make habitat improvements on their lands, while providing regulatory predictability under the Act. They encourage the Service to consider adding language that specifically includes the NRCS conservation plans related to WLFW in the 4(d) rule. They anticipate the Service being actively engaged in the development of this program and expect that any routine activities, such as prescribed grazing, predator control, and other habitat improvements, would be thoroughly vetted in advance by the Service.

Our Response: The Service considers all activities in a NRCS conservation plan that benefit nene habitat as being within the scope of the 4(d) rule exception for nene habitat management activities. The exceptions from the prohibitions of section 9 of the Act specified in this final 4(d) rule target activities to facilitate conservation and management of nene where they currently occur and may occur in the future through increased flexibility by eliminating the Federal take prohibition under certain conditions. These activities are intended to encourage support for the occurrence of nene in areas with land use practices compatible with the conservation of nene, and to redirect nene away from areas that do not support the conservation of the species.

(6) *Comment:* The Department of the Navy requested that the Service amend the proposed 4(d) rule to allow the safe hazing of nene families and goslings away from dangerous areas such as roadways, airfields, and construction areas.

Our Response: The 4(d) rule that we proposed and are finalizing in this rule allows for the safe hazing of nene from dangerous areas. Thus, the Navy's request has been addressed. This final 4(d) rule allows for specific exceptions of nene take under Federal law (*i.e.*, section 9 of the Act), including, but not limited to, hazing that is not

likely to involve lethal or direct injurious take. Intentional harassment activities not likely to cause direct injury or mortality that are addressed in this final 4(d) rule are recommended to be implemented prior to the nene breeding season (September through April) wherever feasible. If, during the breeding season, a landowner desires to conduct an action that would intentionally harass nene to address nene loafing or foraging in a given area, a qualified biologist (*i.e.*, an individual with a combination of academic training in the area of wildlife biology or related discipline and demonstrated field experience in the identification and life history of nene) familiar with the nesting behavior of nene must survey in and around the area to determine whether a nest or goslings are present. The 4(d) rule does not apply to scenarios involving lethal or directly injurious take. Further, any take of nene is still prohibited under State law, and any action likely to adversely affect the nene continues to require consultation with the State. For more details, please see *Intentional Harassment Not Likely to Cause Mortality or Direct Injury* and *Justification* under **4(d) Rule**, below, and our responses to comments (2) and (5).

(7) *Comment:* The Department of the Navy commented that the proposed rule does not list potential take from surveys. Installation biologists routinely conduct surveys to collect data on nene on installation property and in particular surveys for nests during the breeding season. The Navy requests that any unintentional take, specifically harassment, resulting from survey work be included in the 4(d) rule as allowable.

Our Response: We have added unintentional take, specifically harassment, resulting from survey work that benefits and furthers the recovery of nene to the excepted forms of take under *Intentional Harassment Not Likely to Cause Mortality or Direct*

Injury, below. Please see **4(d) Rule**, below, and **Summary of Changes from Proposed Rule**, above.

(8) *Comment*: The Department of the Navy commented that consistent with the 2014 Formal Consultation for Pacific Missile Range Facility Base-wide Infrastructure, Operations, and Maintenance, Kauai, hazing is conducted, and signs are placed to alert drivers; however, collisions still occasionally occur. The Navy requests that vehicular collisions in general (not just during habitat management) be included in the 4(d) rule as allowable take (with the condition that other best management practices are in place to reduce risk of collisions).

Our Response: Vehicle strikes at Haleakala National Park, and across the species' range, are a threat to nene, particularly during breeding season, as discussed in the April 2, 2018, proposed rule and this final rule under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence*. As stated in our responses to comments (6) and (7), the purpose of this reclassification and associated 4(d) rule is to further the conservation of the nene. Vehicle collisions do not achieve this goal; therefore, we did not except them from take prohibitions in the 4(d) rule.

(9) *Comment*: The Department of the Navy noted that the 4(d) rule allows take by law enforcement officers for the aiding or euthanizing of sick, injured, or orphaned nene; disposing of a dead specimen; and salvaging a dead specimen that may be used for scientific study. The Navy requested that the rule allow Federal employees, specifically installation natural resource managers, or any biologists that support the implementation of integrated natural resources management plans (INRMPs) to perform these actions under the 4(d) rule.

Our Response: Under the 4(d) rule, law enforcement officers are allowed to aid or euthanize sick, injured, or orphaned nene; dispose of dead specimens; and salvage dead specimen that may be used for scientific study. In response to the Navy's comment, we noted that the September 2014 section 7 Biological Opinion for their Pacific Missile Range Facility on Kauai covers the incidental take of nene resulting from hazing activities. The Terms and Conditions in the Biological Opinion's Incidental Take Statement address disposition of injured or dead nene as well as who must be contacted. Naval personnel are not authorized to euthanize injured nene; however, they can recover and dispose of a dead specimen in accordance with the Terms and Conditions in the Incidental Take Statement. Injured nene can be collected and delivered to a previously specified care facility to determine if the specimen can be recuperated and returned to the wild. If it cannot be recuperated, the care facility has the authority to euthanize the bird. We do not believe the Navy's natural resource managers possess the expertise to make such a decision and therefore recommend the 4(d) rule not be revised to allow them to euthanize injured individuals. We also do not find it necessary to revise the 4(d) rule to provide the authority for incidental take that is already covered by the biological opinion.

State Comments

(10) *Comment:* The Hawaii State Department of Agriculture (HDOA) made two suggested edits to the proposed rule: (a) that the lease and special permits within the Hanalei NWR be amended to allow agricultural lessees the ability to exercise the same permitted practices identified in the 4(d) rule; and (b) assuming the rule is finalized, they encourage ongoing review of the nene's status on Kauai.

Our Response: Leases and special permits associated with the Hanalei NWR may be able to be revised to accommodate the Federal exceptions outlined in this final 4(d) rule. As discussed under **4(d) rule**, below, the example is take by landowners or their agents conducting intentional harassment in the form of hazing or other deterrent measures not likely to cause direct injury or mortality. We recommend that such hazing not occur during the breeding season. Additionally, any form of hazing is still prohibited under State law, and any proposed action that may affect nene requires consultation with the State. Please also see our response to comment (2). In regard to reviewing the status of nene on Kauai, the Act requires the Service to conduct status reviews for all listed species at least once every 5 years; this analysis will include an analysis of the status of the nene on Kauai.

(11) *Comment:* The HDOA notes that the proposed rule indicates a substantial increase in the nene population on Kauai. In 2004, the Kauai population was estimated at 564 (83 FR 13923; April 2, 2018) and the 2017 population was estimated at 1,107 birds. The HDOA assumes the 2017 count did not include the 640 nene that were relocated from Kauai to Maui and Hawaii from 2011 to 2016 (83 FR 13935; April 2, 2018).

Our Response: As discussed below under comment (12), the Hawaii State Department of Land and Natural Resources (HDLNR) provided us an updated (2017) statewide nene population estimate of 3,252 birds, including 1,482 birds on Kauai, 1,104 birds on Hawaii, and 627 birds on Maui. We have added this estimate to this final rule under *Species Information*. The HDLNR noted that their 2017 count includes the most recent translocation efforts to Kauai and Maui. The April 2, 2018, proposed rule included nene population estimates from 2015, including any translocations through 2015.

(12) *Comment:* The HDLNR commented that a divide exists between the downlisting criteria outlined in the nene recovery plan and the definitions of “endangered” and “threatened” species under the Act. They stated that nene populations clearly do not meet the downlisting criteria as established in the recovery plan, but could qualify for downlisting under the Act’s definition of endangered. The HDLNR provided updated nene population estimates. The HDLNR noted that their 2017 count includes the most recent translocation efforts. Between 2011 and 2016, 646 nene were translocated from Kauai to Hawaii (598 birds) and Maui (48 birds) to reduce aviation safety concerns at Lihue airport on Kauai. They also stated that if the recent translocations had not taken place, there would not be a population of 500 birds on the island of Hawaii; therefore, the nene’s status would not meet the downlisting criteria of a minimum of seven populations, of which two consist of 500 or more breeding adults each on two of the islands of Hawaii, Kauai, and east Maui; and one population of 300 breeding adults. Additionally, they stated there are no populations of 100 breeding adults on “two of the following: east Maui, Molokai, Kahoolawe, or Lanai,” and that there are no nene on Kahoolawe or Lanai, and the population on Molokai has declined from 78 captive-bred birds to an estimated 37 birds after more than 10 years. They acknowledged that there are two or more populations of 250 to 300 breeding birds, depending on how they are divided, and more than two populations between 100 and 250 birds.

Our Response: We appreciate the updated population-wide estimate for nene and the island-specific estimates. We also appreciate the information on nene translocation efforts between 2011 and 2016. According to the values provided, 493 nene were on Hawaii prior to the recent translocations. State data are consistent with our assessment

that there are self-sustaining populations on Hawaii (493, plus the 598 translocated birds, totaling 1,091), Kauai (1,482 birds), and Maui (579, plus the 48 translocated birds, totaling 627). We updated our *Species Information* discussion to include the new and most recent statewide population estimates and translocation efforts. Although the translocations were beneficial, the Hawaii and Maui populations would likely have been self-sustaining over time without the translocated birds. Further, as discussed under *Implementation of Recovery Actions for the Nene* in the April 2, 2018, proposed rule (83 FR 13923–13924), two breeding subpopulations of nene on the island of Hawaii have re-established traditional movement patterns, and recent data suggest that certain key populations are expected to maintain current numbers or increase in the future if the current level of management is continued.

Regarding the perceived divide between the recovery criteria and the Act’s definition of “endangered,” we addressed this in the April 2, 2018, proposed rule under *Recovery Planning* (83 FR 13922–13923), where we discuss that a decision to revise the status of a species on, or to remove a species from, the Federal List of Endangered and Threatened Wildlife (50 CFR 17.11(h)) is ultimately based on an analysis of the best scientific and commercial data then available to determine whether a species is no longer an endangered species or a threatened species, regardless of whether that information differs from the recovery plan. Recovery may be achieved without all of the criteria in a recovery plan being fully met. For example, one or more criteria may be exceeded while other criteria may not yet be accomplished. For further information, please refer to the April 2, 2018, proposed rule (83 FR 13919), as well as the Recovery Planning section of this final rule. We have determined that the nene no longer meets the Act’s definition of

an endangered species, but does meet the definition of a threatened species; therefore, downlisting is appropriate regardless of how or whether the recovery criteria have been met.

(13) *Comment:* The HDLNR commented that the range of nene has contracted and that the species remains vulnerable to extinction on all islands, apart from Kauai (which makes up 9 percent of the nene's historical range) on which mongoose are currently not established but the potential for establishment is high. Mongoose are a significant predator and would dramatically threaten Kauai's nene population.

Our Response: We concur that the range of nene has contracted; however, due to captive-rearing and release efforts, nene are now self-sustaining on the islands of Hawaii, Kauai, and Maui. We acknowledge that nene is a conservation-reliant species, and we anticipate current conservation actions will continue into the foreseeable future. We also recognize that predation by mongoose is a serious threat to nene. As stated in the April 2, 2018, proposed rule and in this final rule, the establishment of a breeding population of mongoose on Kauai would significantly reduce the survival and reproduction of nene on Kauai and, as a result, would significantly increase the risk of extinction of nene. Please also see our response to comment (4).

(14) *Comment:* The HDLNR commented that over half of the island of Hawaii's nene are in two subpopulations at Puu Oo and Hawaii Volcanoes National Park, which are both currently under direct and indirect threats from the Kilauea's volcanic eruption.

Our Response: At the time of Kilauea's most recent activity (May 4, 2018), the April 2, 2018, proposed rule was in the comment period stage; therefore, volcanic activity was not addressed in the proposed rule. We have added an analysis of the effects of

volcanic activity to the nene under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in this final rule.

(15) *Comment:* The HDLNR commented that some Division of Forestry and Wildlife (DOFAW) employees are concerned that downlisting nene and the establishment of a 4(d) rule, and associated provisions under State law, could result in inadequate regulatory mechanisms for the nene and other endangered species in Hawaii. On the other hand, DOFAW appreciates that a more flexible regulatory mechanism to authorize nonlethal take permits is needed in some circumstances (*e.g.*, hazing), and that the 4(d) rule may be effective in implementing a more intuitive approach to managing the bird in specific situations. Revisions to Hawaii Revised Statutes would be required to bring the State law into alignment, and that may take years due to opposition and associated litigation.

Our Response: This reclassification and associated 4(d) rule is designed to give more nene management authority to the State. Upon finalization of this rule, the State will be the main authority regarding how and whether any of the excepted forms of take outlined in this rule will be permitted. Any proposed action that may cause take of nene on Federal lands will still require consultation with the Service. Please also see our response to comments (2), (5), and (24).

Public Comments

(16) *Comment:* Two commenters stated that reclassification of nene will decrease funding for predator control (*i.e.*, mongoose).

Our Response: We are unaware of any reason why the reclassification of nene from endangered to threatened will result in a decrease in funding for predator control.

Upon the effective date of this final rule (see **DATES**, above), nene will still be afforded protections under the Federal Endangered Species Act and the Hawaii Endangered Species Law. Efforts to protect nene, including predator control, are anticipated to continue into the foreseeable future. Although nene have made progress toward recovery, they are not considered to be recovered. Additionally, we recognize that the nene is considered a conservation-reliant species by scientists and thus will require management, including predator control, into the foreseeable future in order to achieve and sustain recovery. Please also see our responses to related comments (2), (4), (5), and (15).

(17) *Comment:* One commenter stated that the only reason nene are doing well on Kauai is because there are no mongoose.

Our Response: We agree that the success of the nene on Kauai is largely due to the lack of mongoose on the island. In addition to the lack of an established mongoose population, the greater availability of lowland habitat on Kauai is considered an important factor. Historically, nene are believed to have bred mainly in lowland habitat, and research has shown that reproductive success is higher in lowland habitats than in upland habitats. We also attribute the success of the nene on Kauai to all of our partners on the island who continue to work collaboratively toward the recovery of nene. Along with our partners, we will continue to implement current biosecurity efforts as well as seek innovative ways to continually improve such efforts to decrease the risk of mongoose establishing on Kauai. Please also see our response to comment (4).

(18) *Comment:* Three commenters expressed that inbreeding is a concern, especially on islands other than Kauai. They stated that genetic testing would be best to determine the threat of inbreeding. One commented that nene are recognized as the most

genetically bottlenecked listed species given their near extinction in the 1940s, and that genetic fecundity of nene is unknown and needs to be adequately assessed and demonstrated as independently viable on all islands on which it occurs before downlisting is biologically supportable.

Our Response: Please see our response to comment (1).

(19) *Comment:* Three commenters stated that the nene should have the highest level of protection because nene is a cultural symbol and the State bird.

Our Response: All listing decisions made under the Federal Endangered Species Act are based on a biological analysis of whether a species is an endangered species or a threatened species because of any of the five factors specified under section 4 of the Act. Please see **Summary of Factors Affecting the Species**, above, for our five-factor analysis on the nene, including new information we received since the publication of the April 2, 2018, proposed rule (83 FR 13919).

(20) *Comment:* Four commenters stated that predatory invasive species such as rats, mongoose, dogs, pigs, and cats are a threat to nene because nene are ground nesters, adults are incapable of flying during molting, and goslings do not fledge until after 10 weeks. Also, with the increase in human population, there is a subsequent increase in dogs, and nene are not instinctively afraid of dogs because they are not a natural predator, which together increases the threat of depredation by dogs. Further, nonnative species may also outcompete nene for food resources.

Our Response: We agree that predatory invasive species such as rats, mongoose, dogs, pigs, and cats are a threat to nene as discussed above under **Summary of Factors**

Affecting the Species. Please also see our responses to comments (4), (13), (16) and (28).

(21) *Comment:* Six commenters stated that the nene is a rare species with low number of individuals (especially on Oahu) and endangered throughout a significant portion of its range. One of these commenters added that the nene is considered the sixth rarest waterfowl in world. Nene might be stable, but stable with a low number of individuals. One commented that breeding success is low on all islands except Kauai. Some of these commenters suggested that nene should be established on all islands on which it once occurred before downlisting is initiated, and that approximately 3,000 individuals is not enough to downlist or consider recovered.

Our Response: We agree that the nene is a relatively rare species, particularly in comparison to other waterfowl, and has a restricted distribution. However, rarity alone does not warrant listing a species as endangered or threatened under the Act. Because nene experience many threats that put them in danger of extinction, nene have been listed under the Act since 1967. The Act's definition of an "endangered species" is any species which is in danger of extinction throughout all or a significant portion of its range (16 U.S.C. 1532(6)). The Act's definition of a "threatened species" is any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)). At the time of its listing in 1967, the nene was at risk of extinction as defined by the Act. Since then, conservation efforts have slowly yet steadily made progress toward the recovery of the nene; today, nene have increased from 30 individuals to over 3,000 individuals with self-sustaining populations on Hawaii, Kauai, and Maui. These three islands make up over 80 percent of nene's

historical range. Nene have not been recorded, nor are they known historically, on Oahu.

Although nene have yet to become established (successfully breeding) on Molokai, a small portion of their historical range, our evaluation of the current range of nene indicates they do not meet the definition of an endangered species (*i.e.*, nene are not currently at risk of extinction throughout all or a significant portion of their range).

Breeding success could be improved on Hawaii and Maui, and continued management is necessary for predator control and other biological and conservation factors that influence nene population numbers and survivorship. Reclassification of nene to threatened status does not mean we consider nene to be recovered. This reclassification rule recognizes the progress of conservation measures since listing.

(22) *Comment:* Seven commenters stated that habitat loss and modification (*i.e.*, human development, sea-level rise and associated erosion of coastal areas) are a threat to nene. One of these commenters provided an example of an upcoming development on the south shore of Kauai, the "New City" which will encompass 480 acres of planned development.

Our Response: We agree that habitat loss and modification are a threat to nene as outlined in the April 2, 2018, proposed rule and this final rule under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range*. Sea-level rise and associated erosion caused by the effects of climate change are not anticipated to bring extensive alterations to nene habitat, as nene are not dependent on coastal areas. Increases in frequency and intensity of both drought and hurricanes are anticipated to bring direct and indirect impacts to nene; however, to what extent and when such impacts may occur is unknown. Please also see our response to comment (28).

Regarding the “New City” plans on Kauai, this proposed development occurs in an area on Kauai that is currently at least partially developed, and nene are not known to occupy the project area nor adjacent areas.

(23) *Comment:* Two commenters stated that before downlisting is warranted, more research is needed to determine the impacts of climate change (*i.e.*, drought, hurricanes, and sea-level rise), the amount (if any) of genetic variability, the impacts from wind energy and wind turbines, and toxoplasmosis. Sea-level rise is not a future threat; it is happening now. Hawaii has already lost approximately 13 miles of beaches and shorelines (Hawaii Climate Change Mitigation and Adaptation Commission, *in litt.* 2015). Further, more intense hurricanes will increase flooding events and thus increase the loss of nene nests due to flooding.

Our Response: We agree that *Toxoplasma gondii* poses both direct and indirect threats to nene as discussed in the April 2, 2018, proposed rule and this final rule under *Factor C. Disease or Predation*. Please see our responses to comment (1) regarding low genetic variation; comments (2) and (24) regarding downlisting and the 4(d) rule; comments (22) and (28) regarding climate change; and comment (25) regarding wind farms.

(24) *Comment:* Six commenters suggested that reclassification from endangered to threatened status will significantly increase harassment and human wildlife conflict. Human-wildlife conflict still exists. With the observed increase in human population, there is subsequent increase in nene take (*e.g.*, more people equals more dogs). Also, more people will likely lead to an increase in hazardous situations, especially if take is allowed during nene breeding season because nene are ground-nesting birds. One of these

commenters suggested only allowing hazing outside of nene breeding season, and then stated that hazing may be an advantage but is a narrow perspective to the conservation of the species. Further, the human dimensions side of nene acceptance deserves immediate Service emphasis (*i.e.*, outreach) to help broaden support for nene. One of these commenters suggested that downlisting nene to threatened status may increase human hunting of nene.

Our Response: Please see our responses to comments (2), (5), (6), and (15), which address similar comments pertaining to downlisting nene and the promulgation of this 4(d) rule. Please also see our response to comment (31) regarding outreach. Regarding hunting, whether nene are listed as endangered or threatened under the Act, hunting nene is still prohibited under current law, and subject to civil and criminal penalties under both Federal and State law.

(25) *Comment:* One commenter stated that wind energy was harmful to nene and that there was a large increase in wind energy production between 2009 and 2015, with new prospects underway.

Our Response: We agree that wind energy production has increased over the past 10 years and that new prospects are underway. We also agree that wind turbines have the potential to harm nene. Nine wind energy facilities are either built or under construction on the islands of Oahu (3), Maui (3), and Hawaii (3). Four of these have active incidental take permits and associated HCPs, one is in the process of finalizing a HCP to receive an incidental take permit for take of nene, three are not permitted for take of nene (because take is unlikely to result from operations on Oahu), and one of the three not currently permitted for take of nene is just beginning the process to seek coverage for nene.

Rigorous and standardized fatality monitoring is conducted on a 4- to 7-day interval year-round for all wind energy facilities that have incidental take permits. These wind energy facilities are required to fully offset their requested take through mitigation that includes predator control, improving foraging (*e.g.*, outplanting favored nene food plants), pen maintenance and construction, and other management actions that benefit the nene. The mitigation actions are carried out on the island where the incidental take occurs. The mitigation actions include specific monitoring components that ensure the mitigation actions are indeed offsetting the requested take above the baseline that exists without the additive mitigation actions. In other words, the mitigation actions must produce nene that, but for the mitigation, would not have been produced. Prior to the Service issuing an incidental take permit, the cumulative impacts of all projects existing and in the foreseeable future that may impact a species are analyzed to ensure the action does not significantly impact the survival and recovery of the species.

(26) *Comment:* One commenter stated that there are inadequate regulatory mechanisms in place to protect nene.

Our Response: We addressed regulatory mechanisms in the April 2, 2018, proposed rule and this final rule under *Factor D. The Inadequacy of Existing Regulatory Mechanisms*. Based on our analysis of existing regulatory mechanisms, a diverse network of laws and regulations provide some protections to the nene and its habitat. Nene habitat that occurs on NWRs is protected under the National Wildlife Refuge System Improvement Act of 1997 and section 7 of the Endangered Species Act. Nene habitat is similarly protected on lands owned by the National Park Service. Additionally, nene receive protection under State law in Hawaii. Although we conclude State and Federal

regulatory mechanisms do not adequately address the threats to nene and their habitats from potential new introductions of nonnative species or continued expansion of existing nonnative species populations on and between islands and watersheds, we believe that with sustained management commitment, these mechanisms could be important tools to ameliorate these threats.

(27) *Comment:* Four commenters expressed conditional support for the proposed downlisting rule if the Service would withdraw or limit the 4(d) proposal. These commenters stated that nene do not eat taro or harm taro production, and the commenters do not want the Service to permit hazing on taro farms on Kauai. To allow this would impermissibly disrupt nene populations in an area where they are highly concentrated. These commenters support efforts to decrease motor vehicle strikes, as a lot occur in Hanalei Valley. They support the 4(d) rule as long as the purpose is to open up and increase positive management for nene.

Our Response: We agree that taro farms on Kauai support large numbers of nene and that taro farms are important, although not ideal, habitat. As outlined in the April 2, 2018, proposed rule and this final rule, the purpose of the 4(d) rule is to facilitate the expansion of nene into additional areas with land use practices compatible with the conservation of nene, and reduce the occurrence of nene in areas that do not support the conservation of nene across the landscape. The final 4(d) rule provides incentives to landowners to support the occurrence of nene on their properties, as well as neighboring properties, by alleviating concerns about unauthorized take of nene. Nonlethal take on any farms, taro or otherwise, is allowed consistent with the 4(d) rule if permitted by the State and in the case of the NWRs, if permitted by their lease language. Harm or

harassment that is likely to cause mortality or injury will continue to be prohibited under the 4(d) rule here because allowing these forms of take would be incompatible with restoring robust populations of nene and restoring and maintaining their habitat. Please also see our response to comment (2); **4(d) Rule**, below; and *Factor D. The Inadequacy of Existing Regulatory Mechanisms*, above, for more information. Regarding vehicle strikes, we agree vehicle strikes are a threat to nene, as outlined in the April 2, 2018, proposed rule and this final rule under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence*, and we will continue to work with partners to reduce the impacts from vehicle strikes on Kauai and throughout the nene's range.

(28) *Comment*: Five commenters stated that continued conservation actions are essential for this rule to work, and that a stronger management plan is needed if reclassification is finalized with the 4(d) rule, as well as to address impacts from climate change. An increase in protection for crucial nene nesting areas is needed, perhaps a large predator-free preserve. The Service also needs to include climate change as part of the larger regulatory discussion, as well as focus on ecosystem stabilization. Federal management is essential for nene.

Our Response: We agree that continued conservation actions are essential to the full recovery of nene. This is true with or without this final reclassification and 4(d) rule as the nene is considered a conservation-reliant species, as discussed in the April 2, 2018, proposed rule under *Recovery Planning* (83 FR 13922–13923). Although classified as threatened upon the effective date of this final rule (see **DATES**, above), nene are still protected under both the Act and Hawaii Endangered Species Law. Please also see our response to comment (2). We also agree that current and future anticipated impacts from

climate change should be part of both regulatory and management discussions at all levels, as well as ecosystem stabilization. However, impacts to nene and nene habitat from the effects of climate change are not fully known. We expect there will be both anticipated (*e.g.*, increased intensity and frequency of drought and hurricane) and unanticipated impacts, although we do not know when such impacts will manifest. Please also see our response to related comment (22). Federal management of nene is expected to continue into the foreseeable future. We also anticipate continued collaboration with State and private partners. The nene recovery plan is rooted in adaptive management, and as the species needs become evident in light of climate change, we will adapt accordingly. We are aware that data indicate an increase in frequency and intensity of both drought and hurricanes, and indicate species range shifts due to a warming ambient global temperature, and we will work with partners to do our best to minimize such impacts to nene and nene habitat.

(29) *Comment:* Two commenters stated that there is an alarming increase in motor vehicle collisions, either because there are more nene or more people, or both.

Our Response: We agree that vehicle strikes at Haleakala National Park, and across the species' range, are a threat to nene, particularly during breeding season, as discussed in the April 2, 2018, proposed rule and this final rule under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence*. The Service uses the best available scientific and commercially data during the compilation of both proposed and final rules. Any pertinent new information we received during the comment period has been included in this final rule.

(30) *Comment:* One commenter shared that there is an investigation underway in Koloa on Kauai regarding a homeowner that allegedly killed four nene with a BB gun.

Our Response: We are unable to comment on alleged or actual investigations. Shooting nene is prohibited under Federal and State law, and subject to both civil and criminal penalties.

(31) *Comment:* Two commenters asked the Service to conduct more outreach for nene and associated current issues, and stated that it would have been better to provide more public information rather than simply referring to readers to <http://www.regulations.gov>. It would be advantageous to broadly communicate the nene as a success for the recovery progress that has been made, and use that to educate the public about endorsing biodiversity.

Our Response: We agree that additional outreach regarding the status of nene and associated current issues would further advance the conservation of nene. We are always seeking more effective ways to best reach the public and create awareness about endangered species and surrounding issues, including nene. Our current methods of outreach include releases to media (local television and newspaper stations), multiple social media stories and website postings, and outreach to the community. We also welcome the public to contact our office if they have questions about nene (please see **FOR FURTHER INFORMATION CONTACT**, above). The nene's trajectory toward recovery is the culmination of years of collaborative efforts between Federal, State, and private partners. Working with partners, we will continue to use a variety of tools to provide information to the public regarding nene, including, but not limited to, social media, websites, news releases, environmental education, and outreach and interpretation.

(32) *Comment:* One commenter questioned the success of nene outlined in the April 2, 2018, proposed rule by citing the release of 2,400 birds between 1960 and 2006, yet the statewide population is currently only 3,000.

Our Response: As discussed in the April 2, 2018, proposed rule under *Species Information* (83 FR 13921–13922), approximately 2,800 captive-bred nene were released between 1960 and 2008. The population estimate provided in the proposed rule (2,855 individuals) was the result of a combination of captive-bred and wild (naturally produced offspring from released birds) nene. We received a more recent statewide population estimate of 3,252 birds from the State. Estimated mortality rates retrieved from capture-recapture analysis on over 2,000 captive-bred nene that were released to the wild ranged from 0 to 87 percent (Black *et al.* 1997, p. 1161; Banko *et al.* 1999, p. 20). Variability was attributed to year of release, age class, and method of release (Black *et al.* 1997, pp. 1167–1168, 1171, 1173). Survival for nene released before the drought years of 1976 to 1983 ranged from 84 to 95 percent; however, during the drought period, nearly 1,200 captive-bred nene perished (Banko *et al.* 1999, p. 20). The cumulative data (including values for captive-bred release, translocated birds, mortality rates, fledging success, life span (up to 28 years for one captive-bred released nene at Haleakala National Park), and other factors discussed in the April 2, 2018, proposed rule) indicate that although nene are conservation-reliant, they are on a path toward recovery. There are self-sustaining nene populations on Hawaii, Kauai, and Maui, and the most recent population estimate we received from the State shows an increase in number of individuals from the 2015 value cited in the April 2, 2018, proposed rule.

(33) *Comment:* Two commenters stated that nene are conservation reliant, especially outside of Kauai.

Our Response: We agree, as stated in the April 2, 2018, proposed rule and this final rule. We anticipate that current conservation actions will continue or increase in the foreseeable future. Please also see our response to comment (28).

(34) *Comment:* One commenter stated the need for an increase in biosecurity efforts. This is most important on Kauai because mongoose are not established there. It is only a matter of time before mongoose establish on Kauai; therefore, nene should remain classified as endangered.

Our Response: We agree that there is a need for increased biosecurity efforts across the island, both for interisland crafts and those from overseas, to address introduction and movement of all invasive species. Currently, the Department of Health is actively implementing a mongoose detection program at Nawiliwili harbor (the location of the 2012 live mongoose capture), and has been for the past two years (Cecconi 2019, pers. comm.; KISC 2019). Additionally, Kauai has adopted the Kauai Mongoose Standard Operating Procedure to conduct island-wide State assessment and early detection rapid response (Phillips and Lucey 2016, entire). Please also see our response to comment (4).

(35) *Comment:* One commenter stated that nene regulations are costly for businesses, due to bird droppings in restaurants and pools and nene eating of farm crops. As nene rebound, businesses are burdened. The 4(d) rule will decrease this burden. Additionally, it is still against both Federal and State law to harm, abuse, or kill a nene.

Our Response: Although this 4(d) rule provides select exceptions from section 9 of the Federal Endangered Species Act, any type of nene take is still prohibited by the Hawaii Endangered Species Law. Please also see our responses to comments (2) and (5).

(36) *Comment:* One commenter stated that nene are a risk to aircraft and the ability to haze nene at the airport will reduce this risk.

Our Response: We agree that nene, and other birds, are a risk to aircraft and aircraft passengers. The effect of this final rule is the exception of certain specific actions from the Act's section 9 prohibitions on take. However, under 50 CFR 402.14, a Federal agency would still need to consult with the Service if the proposed action may affect nene, unless the agency determines with written concurrence from the Service that the proposed action is not likely to adversely affect the nene. Additionally, under State law, a permit is required to haze a federally or State-listed species at airports or elsewhere. Furthermore, State issuance of an incidental take license requires the development of an HCP (HRS 195D-21) or a safe harbor agreement (HRS 195D-22), and consultation with the State's Endangered Species Recovery Committee.

Determination of Nene Status

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of "endangered species" or "threatened species." The Act defines an "endangered species" as a species that is "in danger of extinction throughout all or a significant portion of its range," and a "threatened species" as a species that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The Act requires that we determine whether a species meets the definition of

“endangered species” or “threatened species” because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; or (E) Other natural or manmade factors affecting its continued existence.

Status Throughout All of Its Range

After evaluating threats to the species and assessing the cumulative effect of the threats under the section 4(a)(1) factors, we carefully examined the best scientific and commercial information available regarding the past, present, and future threats faced by nene. We reviewed the information available in our files and other available published and unpublished information, and we consulted with recognized experts and State agencies. The current statewide nene population estimate is 3,252 individuals, with the wild populations on the islands of Hawaii, Kauai, Maui, Molokai, and Oahu estimated to have 1,104, 1,482, 627, 37, and 2 individuals, respectively. Populations on Kauai, Maui, and Hawaii are exhibiting a stable or increasing trend, while the nene population on Molokai is experiencing a fluctuation in population numbers. Continuation of current population trends into the future is dependent on, at a minimum, maintaining current levels of management (*e.g.*, predator control and habitat enhancement). Nene are still affected by predation (Factor C), loss and degradation of habitat (Factor A), and effects of human activities (Factor E). Some subpopulations may potentially be affected in the future by habitat changes resulting from the effects of climate change such as increases in drought, hurricanes, or sea-level rise (Factor A), and nene may potentially be affected in

the future by introduction of diseases such as West Nile virus (Factor C). Regulatory mechanisms do not adequately address these threats. While threat intensity and management needs vary somewhat across the range of the species (for example, the current lack of an established mongoose population on Kauai influences predator control strategies there), nene populations on islands throughout the range of the species continue to be reliant on active conservation management and require adequate implementation of regulatory mechanisms, and all remain vulnerable to threats that could cause substantial population declines in the foreseeable future. Despite the existing regulatory mechanisms and conservation efforts (Factor D), the factors identified above continue to affect the nene such that it is likely to become in danger of extinction within the foreseeable future throughout all of its range. Thus, after assessing the best available information, we conclude that the nene is not currently in danger of extinction, but is likely to become in danger of extinction within the foreseeable future throughout all of its range.

Status Throughout a Significant Portion of its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. Because we have determined that the nene is likely to become an endangered species within the foreseeable future throughout all of its range, we find it unnecessary to proceed to an evaluation of potentially significant portions of the range. Where the best available information allows the Services to determine a status for the species rangewide, that determination should be given conclusive weight because a rangewide determination of status more accurately reflects the species' degree of

imperilment and better promotes the purposes of the Act. Under this reading, we should first consider whether the species warrants listing “throughout all” of its range and proceed to conduct a “significant portion of its range” analysis if, and only if, a species does not qualify for listing as either an endangered or a threatened species according to the “throughout all” language. We note that the court in *Desert Survivors v. Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), did not address this issue, and our conclusion is therefore consistent with the opinion in that case.

Determination of Status

Our review of the best available scientific and commercial information indicates that the nene meets the definition of a threatened species. Therefore, we are listing the nene as a threatened species in accordance with sections 3(20) and 4(a)(1) of the Act.

The Act does not define the term “foreseeable future.” For the purposes of this rule, we define the “foreseeable future” to be the extent to which we can reasonably rely on predictions about the future in making determinations about the future conservation status of nene. The degree of foreseeability varies with respect to the different various threats to nene. While nene are adversely affected by many types of direct and indirect threats, as outlined under Summary of Factors Affecting the Species, most of these threats are ongoing (e.g., predation by already established nonnative animals) and only abated by continued management, such that future threat impacts on nene populations are likely to be dependent on the availability of resources for management. For some potential threats (e.g., introduction of West Nile virus, establishment of mongoose on Kauai), we cannot

predict whether or when they will manifest.

The threats with the greatest potential to cause significant nene population declines relate to predation and loss and degradation of habitat (primarily due to ungulates and invasive plants). Both management (e.g., control of predators, ungulates, and invasive plant control) and biosecurity (e.g., predator and disease control at some ports) have improved the status of nene. However, continuing these efforts into the future is necessary to prevent substantial reductions in the species' viability since nene populations are expected to continue to be conservation-reliant. Thus, the foreseeable future in relation to management and biosecurity is largely dependent on the reliability of management commitments and funding for these purposes in coming decades.

Most nene populations currently exist on lands managed by agencies that function under conservation mandates and have management plans in place (i.e., National Parks, National Wildlife Refuges, and some State lands). Availability of funding for conservation of natural resources, including threatened and endangered species, is increasingly difficult to predict into the more distant future. However, management plans currently in effect are likely to continue for a decade or more (e.g., comprehensive conservation plans for National Wildlife Refuges and general management plans for National Parks function on a roughly 15-year planning cycle [see Service Manual 602 FW 3; National Park Management Policies 2.3.1.12]), and given funding availability, predator management actions are likely to continue as a significant priority in future iterations based on established conservation mandates. Thus, we conclude that there is a reasonable likelihood of continued management for the benefit of nene on these lands over the next 15 to 30 years. Similar constraints apply to the level of foreseeability of governmental

commitments to implementation of biosecurity measures (see Hawaii Interagency Biosecurity Plan).

Over this time frame, we anticipate that threats to nene associated with climate change (e.g., increased duration and intensity of drought, increased frequency and intensity of hurricanes, and flooding associated with hurricanes and sea-level rise) to continue to increase, although we expect the primary issues driving nene population viability will continue to be predation and habitat degradation.

Because the species is likely to become in danger of extinction in the foreseeable future throughout all of its range, the species meets the definition of a threatened species. This rule finalizes the reclassification of the nene from an endangered species to a threatened species.

This final rule revises 50 CFR 17.11(h) to reclassify nene from endangered to threatened on the List of Endangered and Threatened Wildlife. Reclassification of nene from endangered to threatened is due to the substantial efforts made by Federal, State, and local government agencies and private landowners to recover the species. This rule formally recognizes that this species is no longer in danger of extinction throughout all or a significant portion of its range and, therefore, does not meet the definition of endangered, but is still impacted by predation, habitat loss and degradation, and inadequacy of regulatory mechanisms to the extent that the species meets the definition of a threatened species under the Act. However, this reclassification does not significantly change the protection afforded this species under the Act. Other than the “take” that will be allowed for the specific activities outlined in the accompanying 4(d) rule, the regulatory protections of the Act will remain in place. Anyone taking, attempting

to take, or otherwise possessing a nene, or parts thereof, in violation of section 9 of the Act will still be subject to penalties under section 11 of the Act, except for the actions covered under the 4(d) rule.

4(d) Rule

Section 4(d) of the Act states that the “Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation” of species listed as threatened. The U.S. Supreme Court has noted that very similar statutory language demonstrates a large degree of deference to the agency. See *Webster v. Doe*, 486 U.S. 592 (1988). Conservation is defined in the Act to mean “the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [the Act] are no longer necessary.” Additionally, section 4(d) of the Act states that the Secretary “may by regulation prohibit with respect to any threatened species any act prohibited under section 9(a)(1).... or 9(a)(2).” Thus, regulations promulgated under section 4(d) of the Act provide the Secretary with wide latitude of discretion to select appropriate provisions tailored to the specific conservation needs of the threatened species. The statute grants particularly broad discretion to the Service when adopting the prohibitions under section 9.

The courts have recognized the extent of the Secretary’s discretion under this standard to develop rules that are appropriate for the conservation of a species. For example, courts have approved rules developed under section 4(d) that include a taking prohibition for threatened wildlife, or include a limited taking prohibition. See *Alsea Valley Alliance v. Lautenbacher*, 2007 U.S. Dist. Lexis 60203 (D. Or. 2007); *Washington*

Environmental Council v. National Marine Fisheries Service, 2002 U.S. Dist. Lexis 5432 (W.D. Wash. 2002). Courts have also approved 4(d) rules that do not address all of the threats a species faces. *See State of Louisiana v. Verity*, 853 F.2d 322 (5th Cir. 1988). As noted in the legislative history when the Act was initially enacted, “once an animal is on the threatened list, the Secretary has an almost infinite number of options available to him with regard to the permitted activities for those species. He may, for example, permit taking, but not importation of such species,” or he may choose to forbid both taking and importation but allow the transportation of such species, as long as the prohibitions, and exceptions to those prohibitions, will “serve to conserve, protect, or restore the species concerned in accordance with the purposes of the Act” (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

The Service has developed a species-specific 4(d) rule that is designed to address the nene’s specific threats and conservation needs. Although the statute does not require the Service to make a “necessary and advisable” finding with respect to the adoption of specific prohibitions under section 9, we find that this regulation is necessary and advisable to provide for the conservation of the nene. As discussed above in the **Summary of Factors Affecting the Species**, the Service has concluded that the nene is at risk of extinction within the foreseeable future primarily due to predation (Factor C), loss and degradation of habitat (Factor A), and effects of human activities (Factor E) . Some subpopulations may potentially be affected in the future by habitat changes resulting from the effects of climate change such as increases in drought, hurricanes, or sea-level rise (Factor A) and nene may potentially be affected in the future by introduction of diseases such as West Nile virus (Factor C). This 4(d) rule targets

activities to facilitate conservation and management of nene where they currently occur and may occur in the future by excepting the Federal take prohibition under certain conditions. This change is intended to encourage support for the occurrence of nene in areas with land use practices compatible with the conservation of nene, and to redirect nene use away from areas that do not support the conservation of nene. The provisions of this 4(d) rule will promote conservation of nene and expansion of their range by increasing flexibility in management activities for our State and private landowners. The provisions of this rule are one of many tools that the Service will use to promote the conservation of the nene.

Provisions of the 4(d) Rule

This 4(d) rule will provide for the conservation of the nene by specifically prohibiting the following actions that can affect nene, except as otherwise authorized or permitted: import or export; take; possess and other acts with unlawfully taken specimens; deliver, receive, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce. These prohibitions will result in regulating a range of human activities that have the potential to affect nene, including agricultural or urban development; energy development; recreational and commercial activities; introduction of predators; and direct capture, injury, or killing of nene. Regulating these activities will help preserve the species' remaining populations.

Prohibition of Import, Export, and Interstate and Foreign Commerce

We have included the prohibition of import, export, interstate and foreign commerce, and sale or offering for sale in such commerce due in part to the increased

risk of exposing nene to diseases such as West Nile virus. While there are currently no diseases present in Hawaii that jeopardize the viability of nene, unrestricted transport of captive nene in and out of the Hawaiian Islands would have the potential to result in introduction of new avian diseases to the wild population in the foreseeable future. As discussed under Factor C, the introduction of diseases such as West Nile virus could significantly impair the viability of nene in Hawaii. Additionally, although the nene population is currently stable, it is considered a conservation-reliant species and requires active management to maintain this stability. The nene is not thriving to the degree that its population is considered capable of sustaining unrestricted trade, and the resulting increased incentive for capture of nene from the wild, without the likelihood of negative impacts to the long-term viability of the species.

Prohibition of Possession and Other Acts with Unlawfully Taken Specimens

Although the nene population is currently stable, it is considered a conservation-reliant species and requires active management to maintain this stability. The nene is not thriving to the degree that its population is considered capable of sustaining unrestricted capture or collection from the wild without the likelihood of negative impacts to the long-term viability of the species. Because capture and collection of nene remains prohibited as discussed below, maintaining the complementary prohibition on possession and other acts with illegally taken nene will further discourage such illegal take. Thus, the possession, sale, delivery, carrying, transporting, or shipping of illegally taken nene should continue to be prohibited in order to maintain the viability of the nene population.

Prohibition of Take

“Take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Some of these provisions have been further defined in regulation at 50 CFR 17.3. Take can result knowingly or otherwise, by direct and indirect impacts, intentionally or incidentally. Regulating incidental and intentional take will help preserve the nene’s remaining populations.

Although the statewide number of individual nene is stable, if not increasing, species experts consider the nene a conservation-reliant species. The nene is not thriving to the degree that its population is considered able to withstand unregulated take, either intentional or unintentional, without the likelihood of negative impacts to the long-term viability of the species. There are a few circumstances in which allowing either intentional or unintentional take may benefit the nene as a species and further its recovery. We have outlined such circumstances below as exceptions to the prohibitions of take. By allowing take under specified circumstances, the rule will provide needed protection to the species while allowing management flexibility to benefit the species’ long-term conservation. Harm or harassment that is likely to cause mortality or injury continues to be prohibited because allowing these forms of take is incompatible with restoring robust populations of nene and restoring and maintaining their habitat. Anyone taking, attempting to take, or otherwise possessing a nene, or parts thereof, in violation of section 9 of the Act will still be subject to a penalty under section 11 of the Act, except for the actions that are specifically excepted under the 4(d) rule.

Take Exceptions

Under this 4(d) rule, take will generally continue to be prohibited, but the following specific take will be excepted under the Act, provided the additional measures described in the rule are adhered to:

- Take by landowners or their agents conducting intentional harassment in the form of hazing or other deterrent measures not likely to cause direct injury or mortality, or nene surveys;
- Take that is incidental to conducting lawful control of introduced predators or habitat management activities for nene; and
- Take by authorized law enforcement officers for the purposes of aiding or euthanizing sick, injured, or orphaned nene; disposing of dead specimens; and salvaging a dead specimen that may be used for scientific study.

Intentional Harassment Not Likely to Cause Mortality or Direct Injury

The increased interaction of nene with the human environment increases the potential for nene to cause conflicts for business, agricultural, residential, and recreational activities, as well as the potential for nene to become habituated to hazardous areas (*e.g.*, golf courses, roadways, parks, and farms). One of the limiting factors in the recovery of nene has been the concern of landowners regarding nene on their property due to the potential damage to agricultural crops and potential conflicts with normal business, recreational, and residential activities. Landowners express concern over their inability to prevent or address the damage or conflicts caused by nene because of the threat of penalties under the Act. Furthermore, State and Federal wildlife agencies expend resources addressing landowner complaints regarding potential nene damage to agricultural crops and conflicts during normal business, recreational, and residential

activities. By providing more flexibility to the landowners regarding management of nene, we expect enhanced support for the conservation of the species, by providing a tool to reduce potential human-wildlife conflicts in areas incompatible with the conservation of nene, as well as to promote expansion of the species' range into additional areas compatible with conservation of nene across the State.

Hazing and other persistent deterrence actions are management strategies that may be used to address wildlife conflict issues. As nene populations increase, particularly in heavily human-populated lowland areas, they may often come into conflict with human activities. For example, nene are known to use a variety of human-modified areas including wind farms, airports, resorts, golf courses, agricultural operations, residential areas, parks, public recreation areas, and transportation routes. Nene using these areas may present a conflict with normal business activities or cause crop depredation or safety hazards to humans. Humans may also inadvertently harm nene by feeding them, which could result in nene showing aggressive behaviors towards humans, being injured or killed by vehicles or humans, or being placed at increased risk from predators. Methods such as hazing are necessary to prevent and address these potential human-nene conflicts, allowing nene to coexist with areas of established human activity and providing for continued public support of nene recovery actions.

Any deterrence activity that does not create a likelihood of injury by significantly disrupting normal nene behavioral patterns such as breeding, feeding, or sheltering is not take and is not prohibited under the Act.

If an activity creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns such as breeding, feeding,

and sheltering, then the activity has the potential to cause take in the form of harassment. Hazing of nene is considered intentional harassment, which creates the likelihood of injury and has been prohibited take. Under this 4(d) rule, hazing and other deterrence activities that may cause indirect injury to nene by disrupting normal behavioral patterns, but are not likely to be lethal or cause direct injury (including the need for veterinary care or rehabilitation), are classified as intentional harassment not likely to cause direct injury or mortality, and are allowed under Federal law. Such activities may include the use of predator effigies (including raptor kites, predator replicas, etc.), commercial chemical bird repellents, ultrasonic repellers, audio deterrents (noisemakers, pyrotechnics, etc.), herding or harassing with trained or tethered dogs, or access control (including netting, fencing, etc.). Harassment of nene in the course of surveys that benefit and further the recovery of nene is also considered to be within the scope of this 4(d) rule. This 4(d) rule does not apply to activities involving lethal or directly injurious take. For example, laser irradiation used for hazing may cause ocular damage resulting in temporary or permanent loss of visual acuity or blindness (Oregon State University 2017, *in litt.*), impairing the ability of nene to feed or avoid predators or other hazards (*e.g.*, vehicle collisions). Feral dogs or unrestrained pets are known to take nene adults and goslings, and nene are particularly vulnerable to dogs because they have little instinctive fear of them (NRCS 2007, p. 6). Therefore, this 4(d) rule does not cover hazing methods such as lasers or untrained dogs.

Intentional harassment activities not likely to cause direct injury or mortality that are addressed in this 4(d) rule are recommended to be implemented prior to the nene breeding season (September through April) wherever feasible. If, during the breeding

season, a landowner desires to conduct an action that would intentionally harass nene to address nene loafing or foraging in a given area, a qualified biologist familiar with the nesting behavior of nene must survey in and around the area to determine whether a nest or goslings are present. If a nest or families with goslings is discovered, a qualified biologist must be notified and the following measures implemented to avoid disturbance of nests and broods: (1) No disruptive activities may occur within a 100-foot (30-meter) buffer around all active nests and broods until the goslings have fledged; and (2) brooding adults (*i.e.*, adults with an active nest or goslings) or adults in molt may not be subject to intentional harassment at any time. Any observation of nene nest(s) or gosling(s) should be reported to the Service and authorized State wildlife officials within 72 hours. Additionally, follow-up surveys of the property by qualified biologists should be arranged by the landowner to assess the status of birds present.

This 4(d) rule addresses intentional harassment of nene by landowners and their agents that is not likely to result in mortality or direct injury, predator control, and habitat management. Excepting targeted activities that may normally result in take under the prohibitions of the Act will increase the incentive for all landowners to support nene recovery and provide enhanced options for wildlife managers with respect to nene management, thereby encouraging their participation in recovery actions for nene.

We expect that the actions and activities that are allowed under this 4(d) rule, while they may cause some minimal level of harm or disturbance to individual nene, will not cause mortality or direct injury, will not adversely affect efforts to conserve and recover nene, and in fact should facilitate these efforts because they will make it easier to

implement recovery actions and redirect nene activity toward lands that are managed for conservation.

Predator Control and Habitat Management

Control of introduced predators and habitat management are identified as two primary recovery actions for nene (USFWS 2004, p. 52). Control of predators (*e.g.*, mongoose, dogs (feral and domestic), feral pigs, cats (feral and domestic), rats, cattle egrets, and barn owls) may be conducted to eliminate or reduce predation on nene during all life stages. These predators are managed using a variety of methods, including fencing, trapping, shooting, and toxicants. All methods must be used in compliance with State and Federal regulations. In addition to the application of the above tools, predator control as defined here includes activities related to predator control, such as performing efficacy surveys, trap checks, and maintenance duties. Predator control may occur year-round or during prescribed periods. During approved predator control activities, incidental take of nene may occur in the following manner: (1) Injury or death to goslings, juveniles, or adults from accidental trapping; (2) injury or death due to fence strikes caused by introduction of equipment or materials in a managed area; and (3) injury or death due to ingestion of chemicals approved for use in predator control. Under this 4(d) rule, take resulting from actions implementing predator control activities to benefit nene are not prohibited as long as reasonable care is practiced to minimize the effects of such taking. Reasonable care may include, but is not limited to: (1) Procuring and implementing technical assistance from a qualified biologist(s) on predator control methods and protocols prior to application of methods; (2) compliance with all applicable regulations and following principles of integrated pest management; and (3) judicious use

of methods and tool adaptations to reduce the likelihood that nene would ingest bait, interact with mechanical devices, or be injured or die from an interaction with mechanical devices.

Nene productivity and survival are currently limited by insufficient nutritional resources due to habitat degradation and the limited availability of suitable habitat due to habitat loss and fragmentation, especially in lowland areas (USFWS 2004, pp. 29–30). Active habitat management is necessary for populations of nene to be sustained or expanded without the continued release of captive-bred birds. Active habitat management in protected nesting and brooding areas should improve productivity and survival, as well as attract birds to areas that can be protected during sensitive life stages. Habitat management actions may include: (1) Mowing, weeding, fertilizing, herbicide application, and irrigating existing pasture areas for nene conservation purposes; (2) planting native food resources; (3) providing watering areas, such as water units or ponds or catchments, designed to be safe for goslings and flightless/molting adults; (4) providing temporary supplemental feeding and watering stations when appropriate, such as under poor quality forage or extreme conditions (*e.g.*, drought or fire); (5) if mechanical mowing of pastures for conservation management purposes is not feasible, alternative methods of keeping grass short, such as grazing; or (6) large-scale restoration of native habitat (*e.g.*, feral ungulate control, fencing).

In the course of habitat management activities, incidental take of nene may occur in the following manner: (1) Accidental crushing of non-flighted juveniles, goslings, or nests with eggs; (2) injury or death due to collisions with vehicles and equipment; (3) injury or death due to ingestion of plants sprayed with herbicides for conservation

purposes or ingestion of fertilizers; (4) injury or death due to entanglement with landscaping materials or choking on foreign materials; and (5) injury or death of goslings if goslings are separated from parents because of disturbance by restoration activities (e.g., use of heavy equipment or mechanized tools). Under this 4(d) rule, take resulting from habitat management activities is not prohibited as long as reasonable care is practiced to minimize the effects of such taking. Reasonable care may include, but is not limited to: (1) Procuring and implementing technical assistance from a qualified biologist on habitat management activities prior to implementation; and (2) best efforts to minimize nene exposure to hazards (e.g., predation, habituation to feeding, entanglement, and vehicle collisions).

Additional Authorizations for Law Enforcement Officers

The increased interaction of nene with the human environment also increases the likelihood of encounters with injured, sick, or dead nene. This 4(d) rule excepts take of nene by law enforcement officers in consultation with State wildlife biologists to provide aid to injured or sick nene, or disposal or salvage of dead nene. Law enforcement officers are allowed take of nene for the following purposes: Aiding or euthanizing sick, injured, or orphaned nene; disposing of a dead specimen; and salvaging a dead specimen that may be used for scientific study.

Under certain circumstances we may issue permits to carry out otherwise prohibited activities, including those described above, involving threatened wildlife. Regulations governing permits are codified at 50 CFR 17.32. With regard to threatened wildlife, a permit may be issued for the following purposes: scientific purposes, to

enhance propagation or survival, for economic hardship, for zoological exhibition, for educational purposes, for incidental taking, or for special purposes consistent with the purposes of the Act. There are also certain statutory exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

The Service recognizes the special and unique relationship with our state natural resource agency partners in contributing to conservation of listed species. State agencies often possess scientific data and valuable expertise on the status and distribution of endangered, threatened, and candidate species of wildlife and plants. State agencies, because of their authorities and their close working relationships with local governments and landowners, are in a unique position to assist the Services in implementing all aspects of the Act. In this regard, section 6 of the Act provides that the Services shall cooperate to the maximum extent practicable with the States in carrying out programs authorized by the Act. Therefore, any qualified employee or agent of a State Conservation Agency which is a party to a Cooperative Agreement with the Service in accordance with section 6(c) of the Act, who is designated by his or her agency for such purposes, will be able to conduct activities designed to conserve nene that may result in otherwise prohibited take without additional authorization.

Nothing in this 4(d) rule will change in any way the recovery planning provisions of section 4(f) of the Act, the ability of the Service to enter into partnerships for the management and protection of the nene, or the consultation requirements under section 7 of the Act. Under section 7 of the Act, Federal agencies must ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of nene; this 4(d) rule does not alter the section 7 requirements, and Federal actions covered by

this rule are still subject to those requirements. The effect of this rule is to exclude certain specific actions from the prohibitions on take so that such actions may not require an exemption through section 7(o) of the Act. However, under 50 CFR 402.14, the Federal agency will still need to consult with the Service if the proposed action may affect nene, unless the agency determines with written concurrence from the Service that the proposed action is not likely to adversely affect the nene. Interagency cooperation may be further streamlined through planned programmatic consultations for the species between Federal agencies and the Service.

This 4(d) rule addresses only Federal Endangered Species Act requirements, and does not change State law. It is our understanding that current State of Hawaii (HRS section 195D-4) law does not include the authority to issue regulations, equivalent to those under section 4(d) of the Act, to except take prohibitions for endangered and threatened species. Instead, State law requires the issuance of a temporary license for the take of endangered and threatened animal species, if the activity otherwise prohibited is: (1) For scientific purposes or to enhance the propagation or survival of the affected species (HRS 195D-4(f)); or (2) incidental to an otherwise lawful activity (HRS 195D-4(g)). Incidental take licenses require the development of an HCP (HRS 195D-21) or a safe harbor agreement (HRS 195D-22), and consultation with the State's Endangered Species Recovery Committee. Therefore, persons may need to obtain a State permit for some of the actions described in this 4(d) rule. In addition, it is our understanding that current State regulations for endangered and threatened wildlife (HAR 13-124, subchapter 3) do not allow permits for the intentional harassment or hazing of

endangered or threatened species; thus, changes to these State regulations may be necessary to allow the State to issue such permits.

Required Determinations

National Environmental Policy Act

We have determined that an environmental assessment or an environmental impact statement, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations such as this. We published a notice outlining our reasons for this determination in the *Federal Register* on October 25, 1983 (48 FR 49244).

References Cited

A complete list of all references cited in this final rule is available at <http://www.regulations.gov> at Docket No. FWS–R1–ES–2017–0050, or upon request from the Pacific Islands Fish and Wildlife Office (see **ADDRESSES**).

Authors

The primary authors of this document are staff members of the Pacific Islands Fish and Wildlife Office in Honolulu, Hawaii (see **FOR FURTHER INFORMATION CONTACT**).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Regulation Promulgation

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361-1407; 1531-1544; and 4201-4245, unless otherwise noted.

2. Amend § 17.11(h) by removing the entry for “Goose, Hawaiian” and adding an entry for “Goose, Hawaiian (Nene)” in its place under BIRDS in the List of Endangered and Threatened Wildlife to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
* * * * *	* * *			
BIRDS				
* * * * *	* * *			
Goose, Hawaiian (Nene)	<i>Branta sandvicensis</i>	Wherever found	T	32 FR 4001, 3/11/1967; 84 FR [insert <i>Federal Register</i> page where the document begins], [Insert date of publication in the <i>Federal Register</i>]; 50 CFR 17.41(d) ^{4d} .
* * * * *	* * *			

3. Amend §17.41 by adding paragraph (d) to read as follows:

§ 17.41 Special rules—birds.

* * * * *

(d) Hawaiian goose (*Branta sandvicensis*) (nene). (1) *Definitions*. For the purposes of this paragraph (d):

(i) *Nene* means the Hawaiian goose (*Branta sandvicensis*).

(ii) *Intentional harassment* means an intentional act that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. Intentional harassment may include prior purposeful actions to attract, track, wait for, or search out nene, or purposeful actions to deter nene.

(iii) *Person* means a person as defined by section 3(13) of the Act.

(iv) *Qualified biologist* means an individual with a combination of academic training in the area of wildlife biology or related discipline and demonstrated field experience in the identification and life history of nene.

(2) *Prohibitions.* The following prohibitions apply to the nene except as provided under paragraph (d)(3) of this section and §§17.4 through 17.6:

(i) Import or export as provided in § 17.21(b).

(ii) Take as provided in § 17.21(c)(1).

(iii) Possession and other acts with unlawfully taken specimens as provided in § 17.21(d)(1).

(iv) Interstate or foreign commerce in the course of commercial activity as provided in § 17.21(e).

(v) Sale or offer for sale as provided in § 17.21(f).

(vi) Attempt to commit, solicit another to commit, or to cause to be committed, any of the acts described in paragraphs (d)(2)(i) through (v) of this section.

(3) *Exceptions from prohibitions.* The following exceptions from prohibitions apply to the nene:

(i) Authorization provided under § 17.32.

(ii) Take as provided in § 17.21(c)(2) through (7). However, § 17.21(c)(5)(i) through (iv) does not apply.

(iii) Take incidental to an otherwise lawful activity caused by:

(A) *Intentional harassment of nene that is not likely to cause direct injury or mortality.* A person may harass nene on lands they own, rent, or lease, if the action is not likely to cause direct injury or mortality of nene. Techniques for such harassment may include the use of predator effigies (including raptor kites, predator replicas, etc.), commercial chemical bird repellents, ultrasonic repellers, audio deterrents (noisemakers, pyrotechnics, etc.), herding or harassing with trained or tethered dogs, or access control (including netting, fencing, etc.). Nene may also be harassed in the course of surveys that benefit and further the recovery of nene. Such harassment techniques must avoid causing direct injury or mortality to nene. Before implementation of any such intentional harassment activities during the nene breeding season (September through April), a qualified biologist knowledgeable about the nesting behavior of nene must survey in and around the area to determine whether a nest or goslings are present. If a nest is discovered, the Service and authorized State wildlife officials must be notified within 72 hours (see paragraph (d)(4) of this section for contact information) and the following measures implemented to avoid disturbance of nests and broods:

(1) No disruptive activities may occur within a 100-foot (30-meter) buffer around all active nests and broods until the goslings have fledged;

(2) Brooding adults (*i.e.*, adults with an active nest or goslings) or adults in molt may not be subject to intentional harassment at any time; and

(3) The landowner must arrange follow-up surveys of the property by qualified biologists to assess the status of birds present.

(B) *Nonnative predator control or habitat management activities.* A person may incidentally take nene in the course of carrying out nonnative predator control or habitat management activities for nene conservation purposes if reasonable care is practiced to minimize effects to the nene.

(1) Nonnative predator control activities for the conservation of nene include use of fencing, trapping, shooting, and toxicants to control predators, and related activities such as performing efficacy surveys, trap checks, and maintenance duties. Reasonable care for predator control activities may include, but is not limited to, procuring and implementing technical assistance from a qualified biologist on predator control methods and protocols prior to application of methods; compliance with all State and Federal regulations and guidelines for application of predator control methods; and judicious use of methods and tool adaptations to reduce the likelihood of nene ingesting bait, interacting with mechanical devices, or being injured or dying from interaction with mechanical devices.

(2) Habitat management activities for the conservation of nene include: mowing, weeding, fertilizing, herbicide application, and irrigating existing pasture areas for conservation purposes; planting native food resources; providing watering areas, such as water units or ponds or catchments, designed to be safe for goslings and flightless/molting adults; providing temporary supplemental feeding and watering stations when appropriate, such as under poor quality forage or extreme conditions (*e.g.*, drought or fire); if mechanical mowing of pastures for conservation management

purposes is not feasible, alternate methods of keeping grass short, such as grazing; and large-scale restoration of native habitat (*e.g.*, feral ungulate control, fencing). Reasonable care for habitat management may include, but is not limited to, procuring and implementing technical assistance from a qualified biologist on habitat management activities, and best efforts to minimize nene exposure to hazards (*e.g.*, predation, habituation to feeding, entanglement, and vehicle collisions).

(C) *Actions carried out by law enforcement officers in the course of official law enforcement duties.* When acting in the course of their official duties, State and local government law enforcement officers, working in conjunction with authorized wildlife biologists and wildlife rehabilitators in the State of Hawaii, may take nene for the following purposes:

- (1) Aiding or euthanizing sick, injured, or orphaned nene;
- (2) Disposing of a dead specimen; or
- (3) Salvaging a dead specimen that may be used for scientific study; or
- (4) Possession and other acts with unlawfully taken specimens as provided in § 17.21(d)(2) through (4)).

(4) *Reporting and disposal requirements.* Any injury or mortality of nene associated with the actions excepted under paragraphs (d)(3)(iii)(A) through (C) of this section must be reported to the Service and authorized State wildlife officials within 72 hours, and specimens may be disposed of only in accordance with directions from the Service. Reports should be made to the Service's Office of Law Enforcement at (808) 861-8525, or the Service's Pacific Islands Fish and Wildlife Office at (808) 792-9400. The State of Hawaii Department of Land and Natural Resources, Division of Forestry and

Wildlife may be contacted at (808) 587-0166. The Service may allow additional reasonable time for reporting if access to these offices is limited due to closure.

* * * * *

Dated: November 27, 2019.

Margaret E. Everson,
Principal Deputy Director,
U.S. Fish and Wildlife Service,
Exercising the Authority of the Director,
U.S. Fish and Wildlife Service.

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